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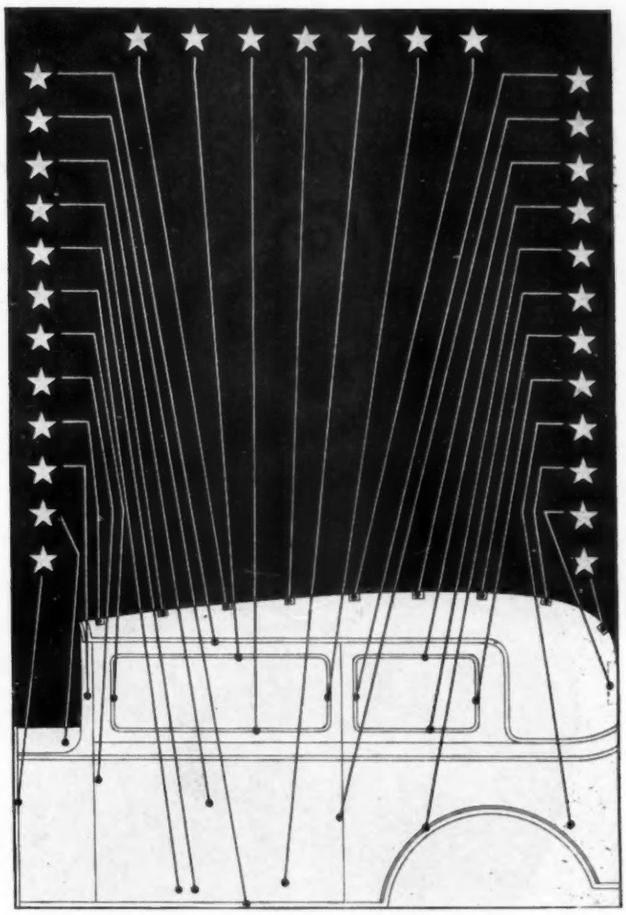

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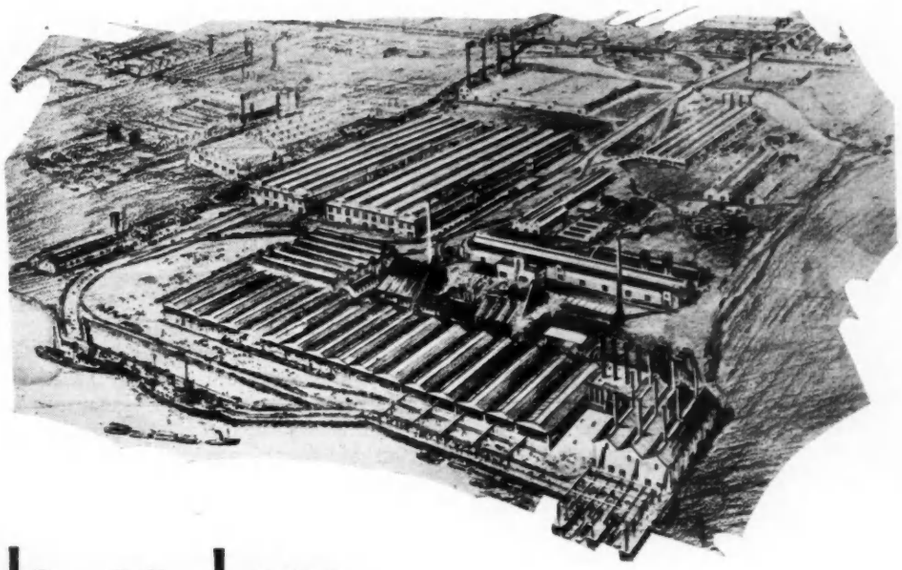


Double or Lose

Seen as Ford's Answer in Europe

by
R. J. Politzer

London economist analyzes prospects of the Dagenham venture, and shows that the British company faces a serious sales dilemma for which no immediate solution seems forthcoming

FORD'S giant new factory at Dagenham, just outside London, England, designed to supply the European demand for Ford products on an improved and more economical scale than has been possible from the 4000-mile-distant Detroit, is gradually coming into production and it is therefore a timely moment to review the prospects of a venture that is costing over $10,000,000 and has taken already three years to prepare.

Before embarking on an analysis of Ford's position in Europe and of the prospects for the Dagenham scheme, one might briefly state that the loss of the European markets to the Detroit plant is a comparatively insignificant one. Of the 1,951,092 Ford cars manufactured in 1929, 1,709,945 were assembled and, with the exception of a very small proportion, sold in the United States. Foreign business of the company thus amounted to only 10 per cent, and of this, sales to Europe can again only account for a certain percentage. According to the articles under which the British company was associated, only the European continent and certain other parts of the eastern hemisphere, related either colonially or geographically, were assigned to it. Detroit will continue to supply China, Japan and Russia. As a matter of fact, many of the British company's markets are still being supplied from Detroit, though an increasing number of engines has been provided from the British company's Manchester works (Trafford Park), which will now be relegated to an assembly, servicing and distribution center. However, as the output of the new Dagenham plant is gradually developed, Detroit will probably be altogether eclipsed as far as the supply of the European and adjoining markets is concerned.

At the end of 1928, a British company, styled Ford Motor Co., Ltd., acquired from Ford Motor Co. of America and Henry Ford the business of the former British Ford company, Ford Motor Co. (England), Ltd., whose investments included the share capital of Henry Ford & Son, Ltd., of Cork, Ireland, as well as the business of the Ford companies registered in Paris (France), Berlin (Germany), Trieste (Italy), Antwerp (Belgium), Barcelona (Spain), Rotterdam (Holland), Copenhagen (Denmark), Stockholm (Sweden) and Heslingfors (Finland). It also acquired the sole and exclusive right of manufacturing, assembling, distributing and marketing Ford and Lincoln motor cars and Fordson tractors and other Ford products in the United Kingdom of Great Britain and northern Ireland, the Irish Free State, the Channel Islands and the Isle of Man, the Continent of Europe (with the exception of such part of European Russia as is now governed by the U.S.S.R.), Asia Minor including Palestine, Syria, Arabia (except Aden—a British territory and therefore falling under the property of the Canadian company which supplies the whole British Empire), Iraq, Persia, Afghanistan, Egypt and certain other parts of Africa (in the possession of the European powers).

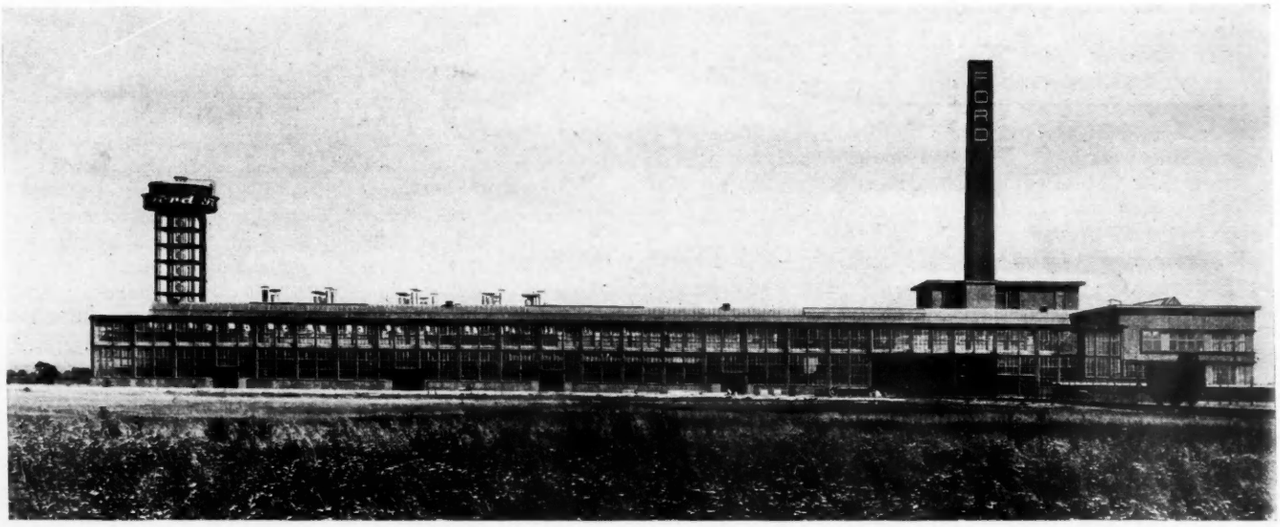
At the same time it was announced that a giant factory was to be constructed on a 300-acre plot of (chiefly swamp) land which the company had acquired on the bank of the Thames at Dagenham. The British company would then be in a position itself to supply the markets it had acquired; labor and materials are cheaper in Europe than in America; the markets available were sufficient to justify an output that should enjoy all the advantages of mass production; the production center was near the distribution field, thus cutting out the high costs of transatlantic freight and introducing a variety of minor but obvious advantages. The scheme, in fact, had all the appearances of being a successful one. It is true that between its conception and its fulfillment a wholly unprecedented and unexpected wave of depression has broken, sweeping away the bulwarks of even the stoutest markets. However, even before the full effects of the depression were felt or its duration suspected, it could be seen that the Ford scheme was fraught with difficulties. Britain's abondonment of the gold standard will assist Dagenham's exports to markets where the gold standard is maintained, but even this assistance, which is undoubtedly taking many a British enterprise temporarily out of the red into the black, can hardly loose the Gordian knot in which, to at least one close observer, Ford's European interests have become entangled.

The prospectus for the new British company, published in December, 1928, stated that the Dagenham plant would have an output of 200,000 units per annum. In 1929, a peak year, sales within the territory of the British company amounted to 100,000. It seemed therefore that sales in Europe would have to be doubled within the next two years in order to make Dagenham an economically practicable proposition. Sales for 1930 were not vouchsafed, the only relevant statement made by the chairman of the British company at the general meeting held in March, 1931, being that "trading profits for the 12 months ending Dec. 31, 1930, are greater than were earned during the previous 14 months." In view of the fact that no sales announcements have been made for either 1930 or 1931, one may assume that the position has not been improved or, at any rate, that the improvement, if any, has not been sufficient to merit its being imparted to shareholders.

The Ford company maintains that the advantages of mass production are only to be obtained in mass units and that the number of these mass units is not of prime importance, i.e., that it may be found as profitable to manufacture only 100,000 units, possibly actually more profitable than manufacturing twice that number. However, more than $10,000,000 has not been spent to house a 100,000 production unit. And I am going to prove that a minimum output of 200,000 is essential for other reasons than those of mere technical production.

In his speech at the last general meeting, Sir Percival Perry, chairman of Ford Motor Co., Ltd., stated: "Our associated companies in Europe purchased the balance of their imported supplies from the United States of America, and during 1930 these imports were approximately £7,000,000 ($35,000,000 at par). Our arrangements are such that so soon as Dagenham is finished most of this business will be transferred to our company." I wonder how Sir Percival Perry felt when

The Ford plant at Cologne, Germany



responsible financial organs here began to draw the obvious inferences of this passage! *The Economist* for April 11, 1931, said: "It would be reasonable to assume a gross profit of at least 10 per cent on this business, and we have the chairman's statement that the additional export business will be very much larger than £7,000,000 if the plans for expansion materialize. In that event it follows that it will be impossible for the Ford company to avoid taking a gross profit of less than £700,000 into its accounts, seeing that these profits will have been earned directly by the Dagenham plant. As the exports from the Manchester plant in 1930 were £3,302,371, it appears that the total exports from England on the completion of Dagenham will be in the neighborhood of £10,500,000." Sir Percival cannot, of course, be held responsible for the conclusions which his statements inspire, but this brings us to the point that the existence of a factory in England does not in itself promise the British shareholder one additional cent of profit, any more than one can reasonably suppose that the $35,000,000 worth of cars, parts and materials which Detroit exported to Europe brought Henry Ford a gross profit of $3,500,000.

As is the case in most manufacturing concerns, no profit is made on manufacture, only on sales. In the same way no Ford plant makes a profit. And unless Dagenham is intent on ruining the subsidiary companies it supplies, it will not try to make a profit either. The British company owns a 60 per cent holding in each of the European subsidiary companies (except in the case of Italy, where the holding is 100 per cent, no issue in the country of registration, as stipulated in the articles of association, having yet been made in Italy). Were the British company to attempt to make a profit on manufacturing the supplies for these markets, the retail prices fixed by the subsidiaries would have to be increased, sales would drop automatically (Ford policy is based on price advantage) and the British company would be the first to suffer by a diminution in its equities in the continental companies. In other words, Dagenham can only produce profits by enabling the continental companies to sell more cars, thus increasing the British company's equity. That is the greatest reason why Dagenham needs an output of at least 200,000 units per annum, or double the present distributable figure.

Another difficulty confronting the Dagenham venture —one that again precludes all possibility of charging a profit on Dagenham production, and quite probably involving the new venture in a loss—is the fact that its production costs are defined. The distributing companies cannot possibly be called upon to pay more for their supplies from Dagenham than they have been in the custom of paying for their supplies from Detroit. The Detroit production cost may be calculated to stand at about $375 or £75 per unit; transatlantic freight may be figured at $50 or £10 per unit; therefore Dagenham has got to sell its products to the continental companies at a figure at any rate not exceeding $420 or £85. Whether Dagenham can economically achieve this is altogether beyond the scope of mere observation; but the necessity of its doing so is easily apparent. Furthermore, as I will proceed to show, it is quite vital that Dagenham not only produce within the Detroit-price-plus-freight figure but that it actually offer its customer companies a definite saving. After all, unless it does effect a saving, what is the use of the whole scheme?

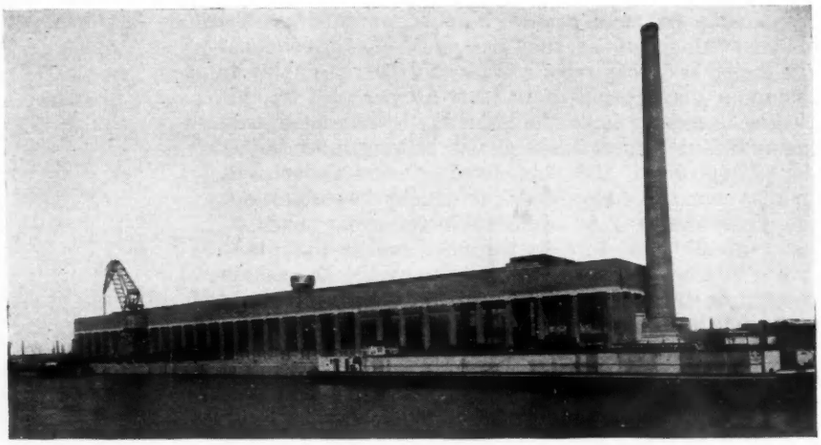
We now have a definite view of the Gordian knot, of the head eating its own tail. Dagenham must produce at less than £85 per unit; it cannot produce at less than £85 per unit unless its output can be increased; its output cannot be increased unless sales throughout Europe can be increased; sales cannot be increased unless prices and therefore costs are lowered; and costs cannot be lowered unless the original product can be procured more cheaply; which is at once the *raison d'etre* and the predicament of Dagenham.

Sir Percival Perry, chairman of the Ford Motor Co., Ltd.

In the British company's prospectus, referred to previously, it was stated that sales within the British company's territories were estimated at 120,000 for 1929. As has already been seen, the actual figure attained fell short by 20,000. Britain was responsible for 75 per cent of the failing. It was expected to sell 40,000 units in Britain during that year; only 25,000 units were sold. At the same time it was stated that the 200,000 Dagenham production was to be divided as to 25 per cent home consumption and 75 per cent export to subsidiaries. Sales in Britain are therefore to reach 50,000, or double the actual 1929 figure; sales on the European continent are also to be doubled, from 75,000 (actual 1929 figure) to 150,000 or 75 per cent of Dagenham's output. Let us now deal with the task of doubling these respective sales figures, and in doing so I shall try to ignore the present crisis and depression which may well nullify the best-planned schemes.

Depression apart, there is no reason why Ford should not double their sales in Great Britain once a factory is producing the finished article within the tariff barrier. It is true that a 100 per cent British Ford has been produced in England by the Manchester plant for some time and only the very slightest retail price reductions have resulted, the average model still standing at about $1,000. In his last speech the chairman indeed admitted: "We have lost substantial sums in certain of our newly organized manufacturing departments. By lost I mean that the cost of manufacture

The Antwerp plant of the Ford company is on the water front



was greater than the previous cost of importation." I wonder if a similar statement will perhaps not occur in future chairman's speeches. But let us take the broad view for a moment and assume the Dagenham scheme an economic and practicable success.

A year ago I was assisted by the Ford company in making the following breakdown of the present retail price of the average Ford model. It was as follows:

Material bought in England	£80
Material imported from U.S.A.	15
English labor	40
Advertising (7½ per cent)	15
Agent's commission (15 per cent)	30
Company's profit (10 per cent)	20
	£200

The last three items will be seen to be strictly proportional charges. The lower the price, the greater the number of sales, and the same turnover spread over a larger number of unit sales means a lower actual cost in the price make-up of each unit. Thus providing Dagenham succeeds in producing a unit at £85, as has been seen to be necessary above, and provided that no attempt is made to increase the profit on the company's sales in Britain to offset losses on sales to the continental distributing companies, then the Ford car should be selling in Great Britain at about half its present price, a little over £100 and over the American retail price, thus:

Manufacturing cost	£85
Advertising (7½ per cent)	7.10.—
Agent's commission (15 per cent)	15
Company's profit (10 per cent)	10
	£117.10.—

With the retail price halved, it should not be difficult to double sales volume. But it must be noted that while this operation helps to achieve the output Dagenham so urgently requires, it does not increase the company's profits on sales. It will get £10 on twice as many sales as previously it was getting £20 on.

Now let us examine the prospects of doubling sales on the European continent. Even ignoring the present conditions of trade, such prospects may be set down as hopeless. The greatest factor in European marketing is the innumerable tariff walls, a factor which at a single stroke deprives the imported Ford product of the price advantage which may be considered responsible for having once given Ford a 43 per cent share of total registrations in the United States of America. Ford sales can only be increased by lowering the retail price. The existence of a Ford factory in England does not make toward such a decrease in price; duties in this case are irrespective of the source of supply. Dagenham can only offer a saving on the transatlantic freight and this margin it may require to take advantage of itself and may not be able to pass on to the distributing companies.

The fact is that Ford retail prices can only be lowered in any single European market as a greater proportion of the car is found there. Recognizing this principle, all Ford subsidiaries purchase as many parts and materials as possible within the confines of their own frontiers, thus reducing customs dues as far as possible. Wherever the market justifies it, an assembly plant has been constructed and parts are imported from America or England or some other distributing center in a knocked-down state in which the duties are less. Again, in Germany an actual manufacturing plant has been constructed on the Rhine at Cologne to produce a "purely German Ford product"—a claim which is being strongly contested by outside sources. German national shareholders, owning 40 per cent of the German company's stock, besides desiring that their money should be invested in German materials and German labor, recognize that the business of their company can only be improved by local assembly. Thus, if sales are to be increased in Germany, it is by cutting out both Detroit and Dagenham as a source of supply. The company must cut off its nose to spite its own face—in one direction or the other!

Even this situation is not so simple. Previous to the building of the Cologne works, the German depot in Berlin drew on Antwerp or Rotterdam for its American supplies. How can the Belgian or Dutch companies maintain operating profits if a substantial portion of its assembly activities are suddenly removed elsewhere?

Ford's position in Italy was described in *Automotive Industries* for Nov. 21, 1931; it was seen that the Ford was retailing at about $1,748, while the competitive Fiat model was priced at $1,045—a difference of $700 or of nearly the price of two Ford cars in America. The Italian case may be exceptional in that it is extreme, but I believe that it is nevertheless representative in principle.

The present state of trade naturally darkens the gloom of the picture, but I believe that the most sudden world recovery would not improve the prospects of Ford in Europe, the very basis on which its expansion is planned being, in my opinion, faulty.

Evidence of the British Ford company's own doubt in the prospects for Dagenham may be seen in the approaches being made to the Canadian company, proposing that it should yield to the British company, naturally at a price, certain territories which could perhaps be more economically served from Dagenham. There is no need to explain why it would be almost incredible should the Canadian company, at a time when every inch of territory is vital to a mass producing factory, yield part of its output to the English company.

JUST AMONG OURSELVES

Scoville's Confident; We Feel Better

RAN into scores of interesting people, ideas and things during New York and Philadelphia show weeks this year; more than usual, as a matter of fact. Saw John Scoville, Chrysler's big statistician, just long enough to learn that he expects 1932 to be a better year for the industry than 1931. That gave us some real encouragement because in our long acquaintance with him, we've never found Scoville overrunning his predictions very far on the optimistic side.

"A year ago," Scoville says, "I estimated that automobile production in the United States in the decade ending in 1940 would be over 45,000,000. I see no reason for changing this forecast now. I look for greater automobile output in 1932; it would not be any occasion for surprise if this increase were as much as 20 per cent."

$$\frac{10 \times 4}{4} = 10$$

WHICH reminds us of a yarn about statistics told at the Chrysler luncheon. A farmer, so the story goes, got into a smoking car conversation with a stranger while riding through a sheep-raising district. As the train whizzed by the various fields in which the flocks grazed, the stranger would say: "See that flock. It contains just 342 sheep." Then at the next field, "There are 823 sheep in that flock."

Finally the train hurtled past the sheep farm owned by this particular farmer. He knew exactly how many sheep there were in his own flock. So he challenged the stranger to call correctly the number in it. "451," came the reply just as quickly as ever.

"By golly, that's exactly right," the farmer marveled. "How do you do it?"

"Oh, it's very simple," the stranger replied, "I just count the sheeps' legs and then divide by four."

Eights and Twelves Divide on Honors

A GOOD many things enter into the salability of an automobile besides the number of cylinders. This is borne out by the way sales are starting off as between the twelve and eight-cylinder lines in several makes which offer both this year.

In some lines the big play—relatively—seems to be going to the twelves; in others the eights are definitely getting the better reception. Price, prestige and power all enter into the public's interest, apparently, and it takes a good guesser to figure out beforehand just how to balance all the factors to get maximum appeal.

Another Fast One From the Wisies

WE had hoped to be able to think of something to write about executives this week, in order to pave the way for another wisecrack which we heard during show week. Having failed in this regard we hereby record the wisecrack anyhow. Let'ergo!

"A vice-president is a fellow who isn't quite clever enough to be president, but who owns too much stock in the company to be fired."

Some Comets Lose Brilliance

HEARD from an experienced production man the opinion that the average factory foreman today doesn't have as much responsibility nor do as much work as the old timer. The past decade has made a lot of industrialists mentally and physically soft, he thinks, adding that "things have been too easy for us (up to 1930, we assume he means.—Ed.) and the inclination has been to build up excessively large organizations of sub-executives."

"There have been too many foremen, sub-foremen and minor executives," this production man goes on to say. "Everybody in the plant had an assistant or two. Obviously if we major executives would do a little more work ourselves and not have so many minor executives, we would not have so great a problem in carrying over bad times such minor executives as were in the organization."

Certainly, the past two years have seen the purging of automotive organizations which suffered from over-executivitis. The result has been a definite strengthening of the organization in many cases, where the more able men have been brought back into the active work on the firing line both in production, sales and general executive divisions.

Sometimes it has revealed softened muscles in higher executives who had been existing on the hardy efforts of subordinates. Sometimes those subordinates have been given their first real chance for responsibility as a result.

Despite the very real hardships which this lengthy depression has brought, there are some cleansing and stimulating results, the effect of which should carry on far into the future.—N.G.S.

Standards for Maintenance Practice

by Joseph Geschelin†

RECENT figures* place 1931 U. S. Truck Registration at 3,300,000 vehicles. In round numbers this represents an investment of $3,500,000,000. Moreover, a statistical average over the last five years indicates that truck operators are making an average yearly investment of about $360,000,000 in new equipment and replacements. These figures picture somewhat inadequately the tremendous importance and size of the motor transport industry in this country.

But this is only one side of the picture. Early estimates, confirmed more recently, indicate that in 1931 the maintenance of motor vehicles (passenger cars and trucks) involved the expenditure of $1,550,000,000 for parts and $2,330,000,000 for labor in utilizing these.

Can this tremendous capital investment be administered more economically? Yes, with the help of repair standards proposed here. At least, in the opinion of many influential fleet operators who are well qualified to speak on the subject.

Take a case typical of one of the biggest fleet operators in the country; a break-down occurs—the vehicle must get back on the road quickly—with a minimum of expense. Does the service man or field inspector know what the minimum cost should be? How can he, when no one has set up instructions to show what may be safely used, what may be salvaged, and how much should be junked immediately? Yet these questions arise daily in every repair shop.

How can the issue be met? The consensus is that there is a crying need for a sensible, workable code of instructions for maintenance work, and if one is devised it must come from the manufacturer. But it must be based on information thoroughly thrashed out between factory engineers, their service organization and the users.

Suppose we call this code "Repair Service Standards" for want of a better name. What would it look like? Briefly, it might consist of a system of factory-approved clearances and tolerances on fits for the vital reciprocating, oscillating and revolving elements.

These data could be expressed in the following form:

Class 1—Desirable Limit—this will give the original factory dimension and clearances. Very little of this is known today, much to the detriment of economical service.

Class 2—Intermediate Limit—to be defined later.

Class 3—Junking Limit—this would specify the condition of maximum wear between mating parts beyond which it is not safe to operate.

Practical service men also will want additional information along the following lines:

1—What is the permissible end play in shafts—such as the camshaft, crankshaft, etc.?

2—Since cylinders are frequently rebored—what is the maximum amount of metal that can be removed before the block must be scrapped?

3—What is the permissible backlash in the various gear trains?

4—Can we determine the maximum clearance between piston and cylinder before serious oil pumping occurs?

5—Can limits be established for out-of-round, taper and oversize for cylindrical fits?

6—What is the depth of case of carburized and heat-treated parts such as gears, wrist pins, shackle bolts, etc.? The usable depth of case usually should be the limit for maximum wear.

7—Minimum brake drum thickness. This would limit the maximum amount of material removed in truing operations.

With this bare statement of an objective, conceded by many to be a tangible approach to efficient and economical operation, let us admit our keen appreciation of the complexities involved. To establish a workable code is no simple task; it

†Abstract of a paper presented at Detroit Annual Meeting of the S.A.E., Jan. 25-29.

*Compiled for this study by the Statistical Department of the Chilton Class Journal Co.

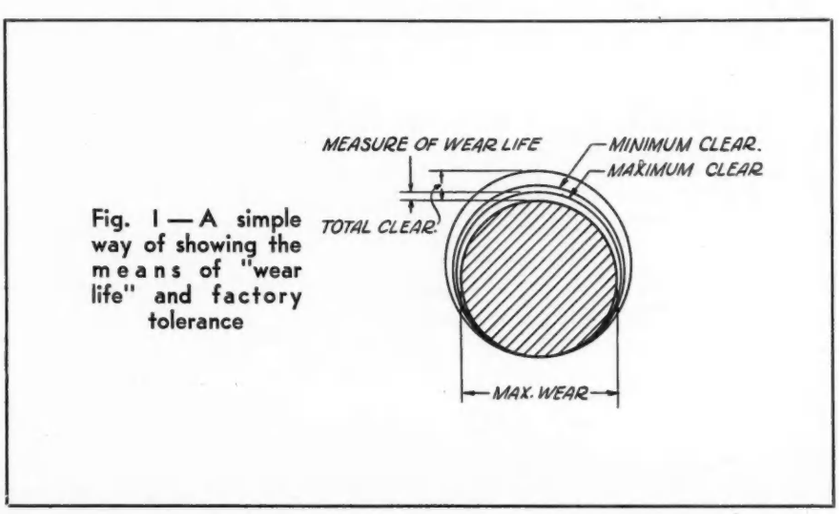


Fig. 1—A simple way of showing the means of "wear life" and factory tolerance

Would Stabilize a Big Parts Market

Factory-approved clearances and tolerances on fits for vital reciprocating, oscillating and revolving elements of vehicles are lacking, and without them the field forces are

WORKING IN THE DARK

will take time, energy and money. Since we must take into account the variations in service conditions and all the complications that go with that, we should start with the assumption that these standards will not be universal in application; that they will vary with the make of unit or vehicle; may vary from model to model in the same line; and may vary in the same fleet.

Standards, as at present conceived, may be divided into two broad classes.

1—Specific Standards—Unique for each make of vehicle. This is the code proposed in this paper.

2—So-called Universal Standards, which constitute an accumulated experience of the service field.

Consider "Specific Standards" first. How may they be established by the factories? Here is how one important motor truck manufacturer, whose work is not yet ready to be made public, did it. "The number 1 clearance, that is, production limit, was, of course, the result of the engineering design of the part, and the result secured in the factory in fitting them to safe minimum clearances which result in maximum wear before replacement is necessary.

"The data on number 2 clearance, in our case, permissible wear, were the result of discussions over a period of years with the service managers and the service personnel of our branches and with many operators who were able to give us some data.

"The number 3 clearance, or the limit at which the parts are no longer serviceable, was determined in much the same way, checked by computation of the stresses that were involved when clearances reached these maximum limits."

This paper proposes the following set-up:

Class 1 — clearances to be given in the form of an upper and lower limit, due to the tolerances permitted in production. This limiting band is intimately tied up with the design of the part. It should be used as the par value for rebuilding and for replacement parts. The establishment of the Class 1 clearances is more basic than most of us realize. It involves, first of all, an intimate statistical knowledge of service life or wear life. In turn, nominal life is intimately related to the character of the tolerances and the fashion in which these can be maintained in production.

A simple way of explaining the meaning of "Wear Life" and its relation to the original factory tolerances is found in Fig. 1. If we define "Wear Life" as a measure of the thickness of a layer of material which may be removed in service, then the Wear Life of a given element will be the layer shown. The next two circles represent respectively the condition of minimum clearance, due to the possible combination of factory tolerances on both the shaft and the hole. The inner shaded portion is the diameter of the shaft at maximum wear.

It is quite startling to observe that the useful wearing layer of material may be only a relatively small proportion of the total clearance between the outer circle and the inner circle. It is easy to see that in some cases the useful life as measured by the thick-

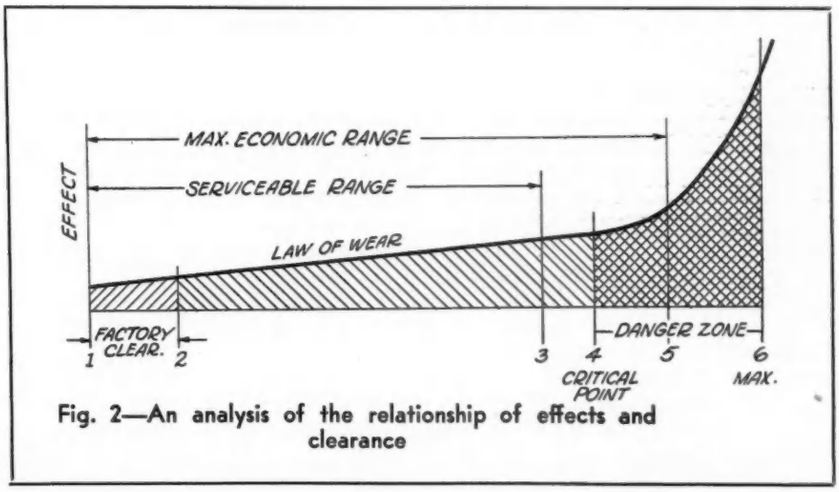


Fig. 2—An analysis of the relationship of effects and clearance

ness of the material which may be removed in service is almost all gone before the vehicle is placed into operation.

Recent discussion in connection with the preparation of this paper indicates that the Class 2 clearance may require a redefinition and a new significance. Thus far, our conception of it has been that of a serviceable limit. This point of view was discussed by the writer in a recent article.* But mature thought indicates that something more is needed. For the assumption is that if a unit is torn down and found to be within the boundary of Class 2, it should be usable, perhaps even without adjustment if the element is adjustable. Is this practicable without reservation?

Examples of Non-Conformity to Conventional Repair Standards

Element	Conventional Clearance	Specific Exceptions
Spark plug point gap.	.022-.030 in.	1932 Nash 9-80 .015 in. Jordan A .018 warm Marmon 75 .025-.028
Diameter clearance clutch sleeve	.0015-.002 in.	Certain pass. car .003-.004 in. due to aluminum alloy material used
Lining to drum clearance	.006-.015 in.	Steeldraulic brake .025-.055 in.
Pinion ring gear Backlash hypoid	.008-.012 in.	Packard 1932 hypoid .004-.005 in.
Piston to cylinder wall diameter clearance	.0005-.00075 in. per inch of diameter	William piston, drive fit in bore
Front wheel toe in	1/16-3/16 in.	Cord front drive car 0 toe in
Weight variation piston rod assembly	½ oz.	Cadillac 8-314 8 lb. 25/32 oz. plus or minus ⅛ oz. Due to type of crankshaft used
Eccentricity medium gage brake drum	.003-.010 max.	Steeldraulic serviceable with .016 in. eccentricity
End clearance connecting rod bearing or crankpin	.004-.008 in.	Wills-Sainte Claire 8 .002-.003 in.
Piston to cylinder wall clearance before audible slap is heard	.008 in. approx.	Some cars same bore will slap with .005 in.
Tappet clearance		Buick 121-129 .008 warm Nash 8-80 .012 warm

The analysis in Fig. 2 is offered merely as a suggestion to a rational approach. It will be assumed for the purpose of discussion that a great many elements in a vehicle, during the course of normal events, follow some law of wear as represented by the curved line. So we have a graph showing the relation between effects and the clearance in the element at any time in its life. We begin with a band between points 1 and 2, which is a range of clearances produced in the run of production. Assume that normal wear takes place gradually, uniformly and practically along a straight line as shown from 1 to 4, the slope of the line representing some service effects which are expected as a part wears.

However, at 4 we reach a critical point, which can be isolated in a great many cases. Beyond this, the behavior of the element becomes abnormal, and enters a danger zone—the band between 4 and 6. Let me give you an example of what the critical point may represent. Consider a crankshaft main bearing. As it wears, slight looseness develops and oil consumption may go up very slightly. But at a certain clearance, oil consumption will become appreciable, and further wear will result in pounding and knocking. This clearance is then the critical point. It may be defined in a similar way for many other elements.

At 6 we have a conception of one of the factors entering into the definition of Class 3. This limit should be taken as the point of maximum wear, and regardless of service conditions the element should be renewed, replaced, adjusted or salvaged.

It is now proposed that the clearance specified in Class 2 should represent the condition at the critical point 4. Where are we if this is accepted? Obviously, if the inspector or the repairman finds an element at the critical point he knows that it is at the danger zone. Depending upon his judgment and the experience of the particular operation, he may then permit the part to remain undisturbed until, say, the next regular inspection, when wear has progressed to some point 5, which we may call the "maximum economic range."

Again, based on a service experience and judgment, the operator will have available a "serviceable range," extending between 1 and 3. In practice this will mean that when a unit is torn down those parts which have not worn beyond some limit of serviceable range, on the safe side of the critical point, will be considered serviceable and can be safely retained in their present condition.

The discussion of Fig. 2 practically defines the clearance in Class 3. However, in addition to mechanical clearance, other things must be considered. The condition of the wearing surfaces is chief of these. Frequently abnormal conditions or irregular wear due to misalignment or other causes make it necessary to reject a part before it reaches maximum clearance. Also maximum clearance may well include other considerations, such as the minimum thickness of the brake drum, usable thickness of case and the amount of material which may be safely removed from cylinder walls.

Now let us consider the matter of universal clearances. These are the lore of the service field, and generally represent the sum total of experience over a long period of years. One of the earlier pioneers in this field is Paul Dumas, who compiled and published a complete code of universal clearances for passenger car service in a supplement to *Motor Age*, November 6, 1924. More recently J. A. Purvis collected data on current practice, which was published in *Automobile Trade Journal*, April, 1931. The most valuable feature of Purvis' work is that of indicating the manner in which the part is measured and the proper tools to use.

Through the courtesy of Colonel Edgar F. Stayer, Commanding Officer at the Holabird Quartermaster Depot, I have been given permission to use the repair standards recently adopted by them. Careful check of these data shows a noteworthy correspondence between these standards and the material compiled by

*"Junk It? Search Me!" by Joseph Geschelin, *Automotive Industries*, Sept. 19, 1931.)

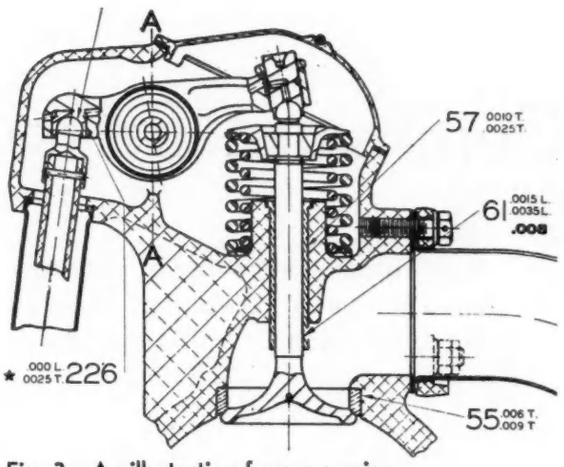


Fig. 3—An illustration from a service manual showing clearances

Paul Dumas. It is certainly gratifying that so prominent an organization as Holabird should place its stamp of approval on these standards.

The main thing to consider in connection with universal standards is the matter of non-conformity to conventional practice. There must be a tremendous number of examples that will occur to practical men. Those in Table 1 were suggested by Paul Dumas, and will probably start a flood of ideas on your own part.

Assuming that standards are set up and are available to the service field, how will they be applied in a practical way? Will this require significant changes in maintenance procedure and in the structure of service organizations now in existence? To some extent, yes, but only in a constructive sense, since the object of standardization is to simplify matters and reduce costs.

Out of a mass of information appear some outstanding factors which may specify an ideal maintenance set-up using factory-established standards. Its objective is to spot quickly and economically the weak element. Here is a suggested set-up:

1—Set-up periodic inspection.

(a) Based on service conditions, atmospheric conditions, terrain, etc.

(b) Based on mileage (as in a case of buses); kw. output (as in a case of gas-electric); engine revolutions; ton miles; gallon miles, etc., etc. The criterion is to be established by each operator.

2—Trouble diagnosis.

(a) Establishment of good methods.

(b) Use of latest available instruments.

3—General Instrumentation.

(a) On the vehicle for automatically recording essential data; speedometer, rev.-counter, recording devices, governor, etc.

(b) For diagnosis—see 2B above and discussion.

(c) For parts inspection—dial gages, inside micrometers, cylinder bore micrometers, ball-bearing tester, scleroscope, magnetic crack detector, etc.

Some satisfactory mechanical means must be found for checking ball bearings. The amount of money involved in the price of bearings and even more so in the overhaul cost of the unit is altogether too large to leave to the judgment of any individual. A most ingenious device, striking in its simplicity, is the ball-bearing tester shown, built by Gisholt Machine Company of Madison, Wis., for testing the bearings used in the Gisholt precision dynamic balancing machine. Briefly, the object is to test bearings dynamically instead of statically. All dimensions, including the run-out in both directions, can be readily checked by dial indicator gages.

A search of some of the literature in the maintenance field shows that a large group of car and truck manufacturers is making a decided effort to provide maintenance men with more information. However, in most cases only one type of clearance is given. In this connection the Cadillac organization has done remarkable work in bringing out their new book, entitled "Cadillac-LaSalle Shop Manual." This has an important section on clearance giving two classes—New and Worn Limit. One prominent truck manufacturer has established a system with three classes of clearances, but this material is not yet available for publication.

What I consider an ideal example of an instruction manual is one which was published June 15, 1931, by the Pratt & Whitney Aircraft Company. This overhaul manual, in addition to discussing maintenance methods, inspection, assembly and reasssembly and the use of tools, also has a comprehensive section on clearances. One of the illustrations, Fig. 3, taken from this book, shows their method. Three classes of clearances are specified wherever possible. In the illustration the plus (+) mark, which appears in red in the book, indicates scrapping when the dimension is exceeded. At other points where three dimensions are given, the dimension to the left, slightly larger in type, appears in red in the book. This is the dimension at which the part is scrapped.

Looking at the matter from a purely cold-blooded profit and loss point of view, is a manufacturer justified in starting a study of the kind recommended here with its consequent burden on the engineering department and its budget? A few pertinent answers are given here without further comment.

1—The engineering study will provide a check on the original factory tolerances with respect to service requirements. In many cases this may indicate changes, sometimes in the direction of more liberal factory tolerances.

2—Is it possible that some units of the vehicle are better and have more useful life than others? Is this justifiable? Service records will provide some answer.

3—Certain chronic field troubles or troubles arising on new models may be discovered and corrected by close contact with the field. One specific example of this is the case of an operator near Philadelphia who used inserted valve seats of a special grade of cast iron more than five years ago. These valve seats gave about two years of trouble-free service. The manufacturer did not profit by this development in its early stage. Another good example is the recent and regularly recurring trouble with vapor-lock. Factories can learn a lot about these things by closer contact with the user.

4—Finally there are certain definite sales advantages. Many truck owners are learning to judge vehicles according to their performance in the field, particularly upkeep costs. Some astute sales manager will find that a good overhaul manual will make a powerful lever for overcoming sales resistance.

Many fleet operators feel that economical operation of rolling stock hinges entirely upon the development of repair and junking standards. We have enough engineering ability and initiative in our industry to meet this challenge.

Cooperation of the Chilton Class Journal Co. Technical Staff, engineers and fleet operators made this study possible.

S. A. E. Standards Committee Balks at

Two reports on subject unreconciled at annual meeting of Society. Eleven divisions submit recommendations at Detroit

ELEVEN divisions of the standards committee of the Society of Automotive Engineers submitted reports at a meeting held on Monday, Jan. 25, in conjunction with the annual meeting of the Society (Detroit, Jan. 25-29). With the exception of two groups of recommendations, those relating to the Lubricants Division and the Tire and Rim Division, all the reports were adopted, although certain revisions from the floor were made at the last moment in some of the reports.

Proposals made by the Aircraft Division included an increase in the maximum load rating of the high-pressure 44 by 10-in. aircraft tire from 6300 to 6500 lb.; a slight change in one dimension of the low-pressure tire valve, and a revised table of dimensions for high-pressure tire valves.

Aircraft Carburetor Flanges

The Aircraft Engine Division, although it had held no meeting since April last, had agreed on a number of proposals by letter ballot. The principal proposal related to carburetor flanges for aircraft engines. Six different types of carburetor flange were proposed, as follows: A single-barrel, four-bolt square flange; a double-barrel, eight-bolt flange; a single-barrel, four-bolt flange with curved instead of straight sides; a double-barrel, four-bolt flange similar in shape to a figure 8; a double-barrel, six-bolt flange and a double-barrel, eight-bolt flange, both of the latter being rectangular form. The original report dealt only with the form and dimensions of the plane of the joint, but flange thicknesses and stud diameters were added at the meeting.

The Ball and Roller Bearing Division had received a request from the International Conference on Standardization at Copenhagen that the shoulder height on shafts for mounting bearing No. 39 of the light, single-row, annular series, as specified in the S.A.E. standard, be increased from 1 to 2.5 mm., to make the dimension conform to the international standard. When considering this matter, the division found that if the shoulder height were increased as requested, the shoulder would be higher than the inner race of the bearing, and it therefore considered the change unwarranted, but it decided to meet the International Conference part way and recommended that the radius of the shaft and housing fillet be changed from 0.4 to 0.6 mm. and the shoulder height from 1 to 1.5 mm.

The division also submitted a proposed new standard for inch-size taper roller bearings, which comprises 21 sizes in the light series, 19 in the medium series and 18 in the heavy series, or 58 sizes in all, ranging from $\frac{3}{8}$ in. to $4\frac{1}{4}$ in. in bore. This was worked out by Ernest Wooler of the Timken Roller Bearing Company and is to replace a list of more than 250 sizes.

A year ago the Ball and Roller Bearing Division proposed a series of lock nuts and washers for ball bearings, but it was later found that the screw threads of the nuts and shafts were not in accordance with the latest practice. This matter was referred to a subdivision of the Screw Threads Division which revised the thread recommendations in accordance with the Class 3 fit of the American (National) fine standard, and the table of lock nuts thus revised was presented at the meeting.

The Electrical Equipment Division made the following proposal with regard to starting motor circuits:

"Starting motor circuits in motor vehicles shall be designed so that the difference between the voltage at the storage battery terminals and the voltage at the starting motor terminals shall not exceed 0.12 volt per 100 amperes, with the circuit at a normal temperature of 68 deg. Fahr."

Revised specifications of non-metallic conduit were also submitted by this division, as was a revision of the present S.A.E. recommended practice for storage batteries.

It was proposed that in the standard for mounting of the ignition unit the term "timer-distributor" be replaced by "distributor," as more in conformity with present usage. Because of the tendency to use storage-battery terminals that are inadequately protected against corrosion, the division recommended that the following note be appended to the general information: "The terminals for storage batteries, including their bolts and nuts, should be thoroughly lead-coated."

The Electrical Equipment Division also proposed a revision of the recommended practice for storage batteries, which includes diagrams and dimension and capacity tables of storage batteries for passenger cars, motor trucks and motor coaches. In the report as originally made the motor-coach battery table included a column headed "Minimum capacity at 8-hour rate," and this was changed to "Minimum capacity at 6-hour rate."

Gasoline Engine Report

The present S.A.E. recommended practice for crankcase drain plugs specifies a $\frac{3}{8}$-18 plug. The Gasoline-Engine Division had come to the conclusion that the plug is too small, and in its report it recommended that three sizes of plugs be specified, viz., $\frac{1}{2}$-14 pipe thread, $\frac{3}{4}$-14 pipe thread, and $\frac{7}{8}$-18. The former two are to have square heads, while the last mentioned is to have a hexagon head. Widths of the sides of the heads were also given.

Another proposal by the Gasoline-Engine Division was to the effect that the Society's standard for silent chains be cancelled.

The Iron and Steel Division, which many years ago began to prepare physical property charts for S.A.E. steels in which such properties as tensile strength, yield point, elongation and reduction of area are plotted against the drawing temperature employed with a steel which previously has been treated according to

Free-Wheel Oils

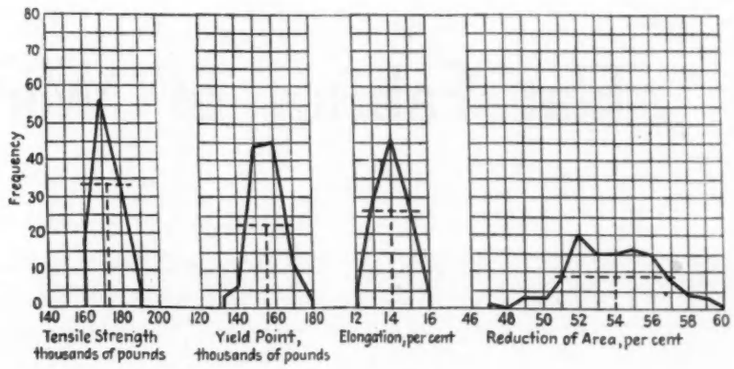


Fig. 1—Frequency curves of physical properties of S.A.E. No. 3130 steel. Results were obtained from 112 samples which were drawn at 800 deg. Fahr.

definite specifications, has now come to the conclusion that this is not the best method of presenting data on mechanical properties. There are tolerances both on the chemical composition of the steel and on the temperatures and other factors entering into the heat treatment, and when a number of specimens of a given S.A.E. steel are subjected to a given heat treatment and are then tested, the results naturally are not absolutely identical, but spread somewhat. If results from a large number of tests are plotted, a median curve drawn through the points obtained is very similar to a curve of probabilities. Most of the points representing observed values are located about midway between the points representing the extreme values of observations, and the further an observation value is from the mean, the less frequent is its occurrence. In Fig. 1 are given such "frequency curves" for the tensile strength, yield point elongation and reduction of area obtained in tests on 112 specimens of S.A.E. No. 3130 steel. The mean value of any of the properties charted is obtained from the corresponding curve by planimetering the area under the curve, dividing it by the length of the base of the curve, and then constructing a rectangle on that base which has the same area. The height of the rectangle then denotes the mean value of the particular property of the steel, while the distances from the top of the rectangle to the peak and the bottom of the curve represent the positive and negative variations in the property. From a series of such curves for each property, each curve corresponding to a given drawing temperature, curves of the relation of the particular property to the drawing temperature are then drawn. These curves are plotted in sets of three, one, in solid line, representing the mean value and the other two, in dashed lines, the maximum and minimum values that may be expected. Two such curves, of the tensile strength and yield point of S.A.E. No. 3130 steel, are reproduced in Fig. 2. The extra heavy line in each diagram is the former S.A.E. curve for the same steel after it has been quenched in water, and it will be seen that somewhat better values are now obtained.

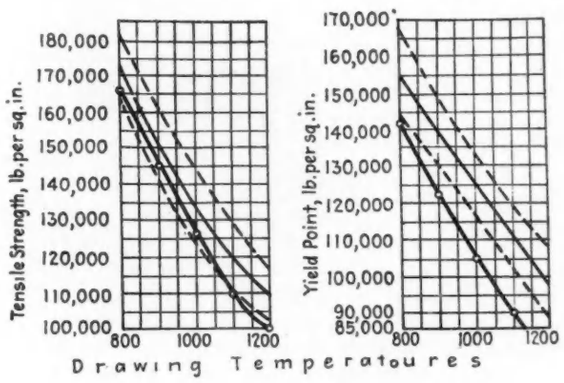


Fig. 2—Variation of tensile strength and yield point of No. 3130 steel with drawing temperature—mean, maximum and minimum values

Curves of the new type have been evolved so far for two steels, the Nos. 3130 and 6130.

A supplementary report was made by the Iron and Steel Division giving definitions of terms relating to heat-treatment operations.

Two reports were made by the Lighting Division, one recommending to change reflex reflectors to eliminate their optional use in place of tail lamps. The second report, on lamp bulbs, recommended the use of single-filament 32 candle power and double-filament 21-32 and 32-32 candle power bulbs.

Free-Wheeling Lubricants

It was revealed by the report of the Lubricants Division that a peculiar situation had developed in relation to lubricants for free-wheeling transmissions. Free-wheeling units, it was brought out, require a lubricant whose viscosity varies as little as possible with changes in temperature. If the viscosity of the lubricant is too low—which is most likely to be the case when the temperature is high—there is likely to be objectionable noise in the unit, while if the viscosity is too high—in cold weather—the free-wheeling unit may fail to take hold owing to failure to squeeze out the lubricant from between the rollers and their supporting surfaces. A majority report was submitted which recommended the adoption of specifications for three lubricants for free-wheeling units, for use within different ranges of atmospheric temperature. This was signed by W. S. James of the Studebaker Corporation, E. W. Upham of the Chrysler Corporation, and H. C. Mougey of General Motors Corporation. In addition a minority report, signed by representatives of ten oil companies, was submitted, in which the contention was made that the formal adoption of these specifications as a recommended practice for viscosity numbers for oils for free wheeling transmissions would be most inadmissible at present.

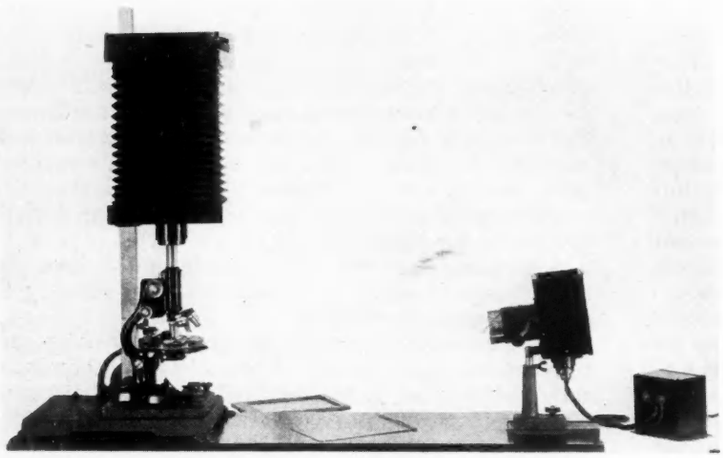
This report was referred back to the division with the recommendation that the two factions get together and agree on what should be done.

The Motor Truck and Motorcoach Division made a proposal with respect to six-wheel chassis lengths and the Screw-Threads Division with respect to slots in hexagon nuts, both of which were adopted.

Flat Fabrics of Widely Varied Design

Laboratory control of production processes at American Woolen Company's plant permits rigid criteria on selection of basic materials, and is organized much as it would be in any parts production plant in the industry

by
Joseph
Geschelin



Bausch & Lomb latest model research microscope with photographic attachment set up in the central laboratory

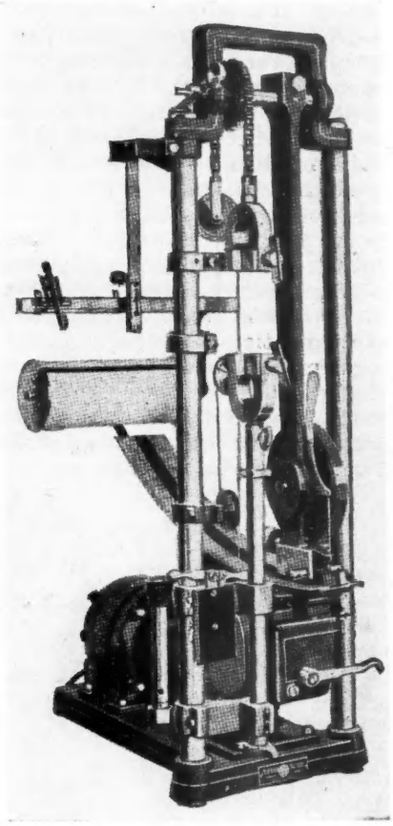
VISITORS to the 1932 Auto Show in New York saw flat fabrics (so generally used on this year's cars) woven before their eyes on a broad loom. This exhibit by the American Woolen Co. signalized the fact that the world's greatest woolen organization is geared up to meet the demand for automobile flat fabrics.

What is probably of first importance in the styling of body interiors, is the creation of fabric designs. These are constantly submitted to the mills in the form of sketches or small samples of fabric. Ultimately, pattern blankets are woven on experimental looms—each blanket carrying out a single motif with its possible variations. By this means it is possible to weave a single piece of fabric with a large number of pattern and color combinations for direct comparison. One of the new pattern "blankets," several of which contain over 600 design combinations, presents a novel effect which is expected to eliminate or neutralize the effect of spotting or dirt. This will be shown in Detroit for the first time.

Fabrics can be very complex. A beautiful piece of fine Bedford Cord fabric, intended for high-priced cars, is 59 in. wide and in the width has 10,000 ends of yarn, each composed of two strands, making 20,000 individual strands in the width or about 340 to the inch. By calculation it was found that the total number of interlacings in the weave is 13,466 per square inch.

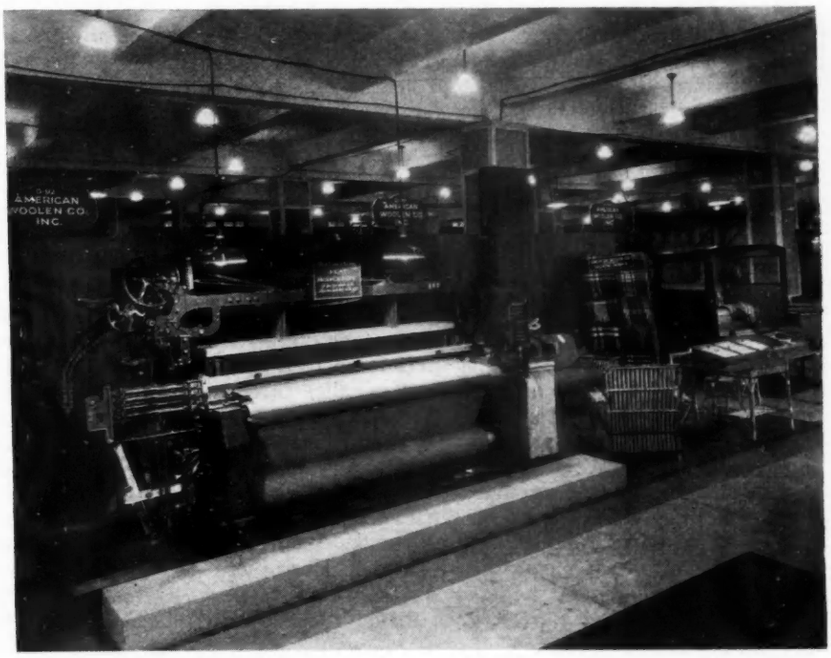
In the selection of any textile, serving both utilitarian and decorative purposes, the following considerations are easily of greatest importance:

1. Permanency of color.
2. Durability or wear-life.
3. Waterproofing.



Motor-driven, recording, tensile testing machine made by Alfred Suter. This machine produces an autographic chart giving the load-elongation curve for specimens of fabric

Available for Cars in All Price Classes



Weaving flat fabrics at the 1932 auto show in New York. This unusual exhibit attracted considerable attention

Accordingly the work of the American Woolen Co.'s research department is directed to the details which bear on these criteria. Of course, there are many other activities of a related nature, but the following few are of particular interest in this article:

1. Waterproofing methods and testing technique. At the present time there seems to be little unanimity in the textile industry as to standardized procedure. In fact the problem is now engaging the attention of the Bureau of Standards. In the absence of a standard method of testing, two different tests are used:

(*a*) A machine which they have devised for the purpose, in which a sample of cloth is stretched over a cylindrical opening containing water. Pressure is applied by means of varying the hydrostatic head, the criterion being the pressure at which the first drop of water seeps through the cloth.

(*b*) The second method, and one which is generally used, is to lay a sample of cloth on a circular frame, permitting sufficient slack so that the cloth drops down in a cup shape, the distance from the top to the bottom being two inches. This depression is then filled with water and the underside of the cloth rubbed with the fingers at regular intervals. The criterion here is the length of time in hours required to wet the underside.

2. Color permanence. All color dyes are tested initially to select the best product. Then the dyed fabric is tested for fading and fugitive components on the Fade-O-Meter—a companion to the Weather-O-Meter, which is well known to those testing paint panels. The Fade-O-Meter uses a carbon arc lamp with a pair of carbons, one of which has a special core designed to filter all emanations but the actinic rays.

3. Durability, as a measure of wear-life is another problem which has been made the subject of fundamental research at the Bureau of Standards and other laboratories. For the present, this company has decided that the most rational test for durability is that of fabric-to-fabric abrasion.

4. A test for tensile strength supplements the information given by item three. This laboratory uses a recording tensile testing machine in which the sample is stretched to the breaking point and a record automatically made of the load, elongation, and ultimate strength. A complete test consists of a combination chart giving the load-elongation curve for the fabric before and after the abrasion test.

5. The tensile strength of yarn is, of course, of fundamental importance. Yarn is tested on a machine which stretches a skein containing a measured length of thread. This test gives the ultimate strength and total elongation.

6. Twist of yarn. The amount of twist is a measure of the strength of an individual strand. A sample of yarn is placed in the testing machine and a measured gage length, usually ten inches, unwound by measured turns, until the strands lie parallel.

Probably a good estimate of the effectiveness of a research organization is its ability to function as a service to the user. This is precisely one of the functions of this research department. For example, at the present time, one of the assignments is the development of a fabric designed for a new use—to cover rubber window channels. The conditions of direct exposure to sunlight and the elements constitute a serious problem which requires the determination of fast dyes to stand up under these conditions.

Since the work of the research laboratory is aimed at the acceptable chemical and physical properties of raw ingredients and finished products, quality control in the mill is intimately related to this program and parallels it in many respects. In fact, the larger mills

have their own research laboratories which are identical with the central laboratory, although operating necessarily on a smaller scale.

A further tie-up with the work of the central research laboratory is found in the control of every step in the production process. Here are a few outstanding examples:

1. Grading wool from fleeces.

2. Perhaps the most striking sequence of operations is that of "drawing" worsted yarn where 30 yards of top is drawn into 33,000 yards of yarn. Starting with the "top" (a soft, heavy strand of combed wool fibres), the fibres are drawn in a series of operations into the finished thread. The tolerance on this process is a variation not exceeding one per cent of the established weight for a given number of yards.

3. In a similar fashion the spinning operation of woolen yarns is carefully checked, the weight for a given number of yards being held within one-five-hundredth (1/500) of an ounce.

4. Inspection spooling is a very interesting operation. High speed machines are used on which the yarn from a large number of tubes (sometimes as many as 200) speeds in parallel threads on to a large reel or spool. As the wide band of parallel threads moves along, the operator spots defects such as loose fibres, knots, etc., stops the machine, rapidly makes the repair, and starts it again.

5. Operations in the dyeing department are checked by testing samples of fabric on the Fade-O-Meter.

6. Perhaps one of the most expensive inspection operations is that of mending the fabric. Each piece of cloth as it comes off the loom "in the grease" (i.e., before fulling and cleaning), goes through the mending department. The cloth is first inspected over a light which reveals any slight loom imperfections. These are carefully marked and the cloth sent to the repair room where it is repaired by hand and again inspected over the light.

7. Finally the cloth is tested for strength before shipping, by an inspector at the end of the line.

Unlike many familiar processes in metal working, the manufacturer of yarn and cloth still depends upon individual skill in many important respects. This, despite the highly scientific control, which is found at every step. One example is the grading of wool, which depends entirely upon the skill of the operator. Another is dyeing, where color value depends upon the skill of the operator.

These reasons and many others associated with all production processes, make it necessary to establish manufacturing tolerances. For automotive purposes, reasonable tolerances should be established on a mutually acceptance basis on at least the following qualities.

1. Color match.
2. Color permanency or fastness.
3. Durability or wear-life.
4. Waterproofness.

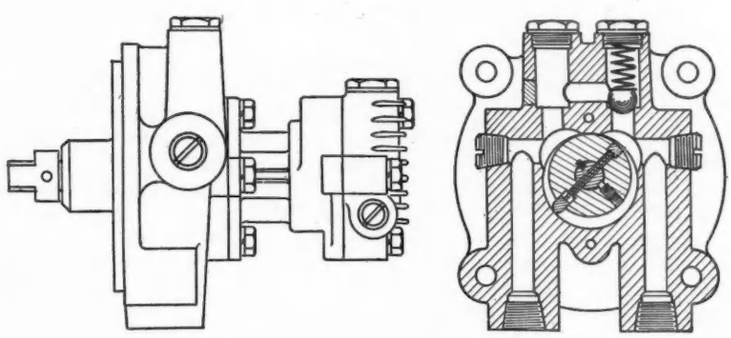
Although many important processes and tests are well standardized, color and finish still are matters of personal judgment and subject to considerable question. For this reason, the basis for tolerances on the finished product as well as methods of testing these should be mutually agreed upon. This will simplify the problems of both the user (which may readily include manufacturers of automobiles in all price classes) and the maker.

Evans Develops Hydraulic Pump to Operate Auxiliary Mechanisms

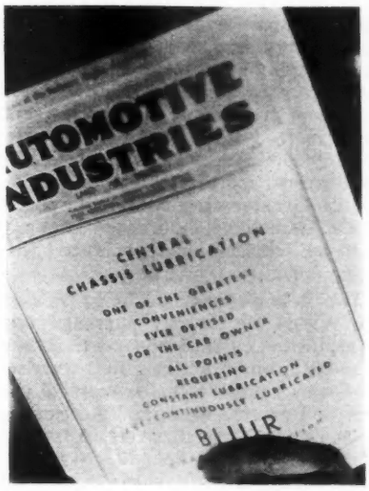
THE Evans Appliance Co., Detroit, Mich., has developed an hydraulic pump for operating hydraulic mechanisms, and also a combination consisting of an hydraulic pump and a fuel pump in one unit. The latter, we understand, is being used by several aircraft concerns.

The hydraulic pump has a relief valve incorporated in it, which makes a return line from the relief valve unnecessary. This valve is said to assure a constant operating pressure up to 800 lb. p. sq. in. It is claimed that with this hydraulic pump the landing gear of an amphibion can be lifted in from 20 to 22 seconds, and lowered in about the same time.

The fuel pump combined with the hydraulic pump is of sufficient capacity to feed two engines and is said to maintain a constant pressure at the carburetor at all times. The hydraulic pump weighs 2¾ lb. as compared with 12 lb. for a hand pump used for the same purpose, while the combined unit weighs 4¼ lb. The power-operated hydraulic pump has several advantages over a hand pump, which latter must be worked by the operator to raise and lower the landing gear while the ship is in motion.



Side elevation and section through combination pump



The Forum

Preheating the Fuel of Diesels

Editor, AUTOMOTIVE INDUSTRIES:

Apology is made for the sketchiness of the following disclosure, but in view of the absence of news of novel attacks on the high-speed Diesel problem in the publications of the world, the mere existence of a radical bit of research may be of interest, however far-fetched it may sound in so meager a disclosure. Full disclosure will gladly be made when the Patent Attorney says the word.

Edward Adams Richardson's letter in the Oct. 10 Forum was, in my opinion, the most illuminating analysis of the problem of the High-Speed Diesel I have yet read in any language. Barring possible research work not yet published, American designers seem to be plowing old ground, as are the designers of the world, with the exception of Ricardo, in England, and Kurt Neumann in Germany. Huckle of Mass. Institute of Technology has a cylinder head that is a practical advance, but I have not heard of any manufacturer with foresight enough to use it; Hill has developed the ante-chamber to a state of high promise, as has Ricardo, and Cummins has a practical engine of the auxiliary chamber-in-piston type. But I cannot see the ante- and pre-combustion chamber as anything but a half-way house on the way to the final high-speed Diesel, which will be free from these makeshifts.

But necessity is the mother of makeshifts, and even makeshifts that work are more fruitful than research repeated and re-repeated on sprays that, if they penetrate, do not spray, and, if they spray, do not penetrate. Sprays which are shot from single and multiple orifices, orifices long and short, and orifices helical and straight, usually into static compressed air, that was never found in an engine cylinder, and never will be.

Years ago, before I had even seen a Diesel and had just begun to hear rumors of the Diesel cycle being attempted without air-injection, when I knew so little of the subject that I smile now at my temerity, I hit upon the germ of a system which would leave sprays to the inventor of them. At that time I had but a dim conception of it and have taken a number of years to bring it to even a concrete conception on paper.

About two years ago I started to build one and as it draws near to a practical perfection, I find results in accord with Mr. Richardson's analysis and Professor Robertson Matthews's comments thereon.

1. Preheating is effected by purely mechanical means, and occurs on the first revolution of cranking.

2. The method of preheating takes into "consideration . . . the intake stroke of these (injection) plungers," cited by Professor Matthews in the Forum of Nov. 14, in that the preheating begins after the upstroke of the injection plunger starts.

3. Preheating is carried automatically to the ignition point, irrespective of what fuel is used.

(So far, I have tried only "Packard Diesel fuel.")

4. Preheating is complete *before* "the fuel has left the injection system," as cited against pre- and ante-combustion chambers, by Professor Matthews.

5. The whole cycle of this system can be timed to any "advance" or "retard" in respect to the cycle taking place in the power cylinder.

6. The fuel is under constantly increasing pressure, therefore cannot expand due to temperature increase.

7. Since the fuel enters the power cylinder, at or above ignition temperature, any compression ratio may be used in the power cylinder.

8. This wide range of compression ratio will admit of the characteristics of a given engine being designed with the chief characteristic in view, viz:

High weight, high compression, high fuel economy.
Medium weight, medium compression, medium fuel economy.
Low weight, low compression, low pressure stresses.

The compression toward which I am now working is in the order of 250 to 300 lb. per square inch.

HARLAN HONN.

Why Fleet Men Ignore Ratings

Editor, AUTOMOTIVE INDUSTRIES:

Factory ratings, in my opinion, are arbitrary propositions and do not mean very much because all units making up a truck are not engineered to the same capacity. Heavy-duty trucks are capable of operating under loads of 150 per cent of present factory gross ratings if rim and tire sizes are adequate and gear ratios proper. For work under 20,000 lb. gross one of the many "overgrown" passenger cars will do if strengthened in some units. For longer life a truck company's lighter duty truck will do for 50 per cent overload, but for duty like dump work or for use over dirt and gravel roads not too carefully surfaced, we would load these vehicles according to factory ratings with altered gear ratios.

As a matter of fact, the basis for many ratings seems to be the load-carrying ability of some of the weaker units, with the result that trucks are more often under than over-rated.

From the operator's standpoint, gross ratings should start with tire sizes. In my opinion, ratings of loads for each size tire, as set by tire manufacturers, are very conservative, as we consistently overload a well-known tire 15 per cent without loss of mileage. We use balloons exclusively for highway work and obtain mileages of 40,000 to 60,000 and get a salvage value from the tire as well.

Rim and wheel size should agree with tire sizes. For instance, when

a certain truck manufacturer put out its 3-tonner with 30 x 5 tires, and then changed to 32 x 6 rims and tires, and their dealers finally put on 34 x 7 tires, there was too much extension of duty, which was reflected in speedometer changes necessary to compensate.

Factory ratings on axles probably are made to cover extreme dump truck use, while we make fast runs with double loads on pavements. As proof of my contention, we recently sold a worm and gear that had been operated for two years under overload and received for it something like one-third the cost of the improved worm and gear we installed.

Springs usually are adequate for their ratings only, so we always build them up to our requirements.

I have no criticism to make of the universal joints except that in some six-wheel installations there is too much oscillation. A feature some manufacturers might note, however, when furnishing optional worm or bevel drive, is alignment, otherwise the rear caster angle and elevation of carrier bearings will be improper. Many joints are destroyed from error in alignment at this point without the user, dealer or even the manufacturer knowing why.

Some manufacturers using fairly light main transmissions are employing annular ball bearings in their mainshaft assembly. These bearings seem to be unable to stand up under overloading, although adequate for advertised rating. But since dealer and factory differ 100 per cent in their ratings of the same truck, on transmission in over 12,000-lb. gross trucks should have light-duty bearings. This applies to the pilot bearings as well, which should also be heavier.

While clutches are rated all right for 100 per cent overloads, the flexible tubes used for lubricating throwout bearings should be stronger to prevent breakage and throwing of lubricant into the case instead of putting it into the bearing.

Disk-type brakes are working out better than the drum type, especially in regard to holding ability, drag and service. Parts are sometimes destroyed by the higher application pressures of some boosters, which are too powerful for the light type of service brakes used. But these cases are rare.

Frame sizes for the most part are heavy enough for 100 per cent overload, but even with the best a constant weaving takes place. Side rails should be kept at a fixed distance from each other. By anchoring through fabric (not rubber) blocks, a limited amount of parallel weaving, to take up the sway of the load, is permitted, thereby curtailing breaking of cross-members and pulling and shearing of rivets. A factory expense of ten dollars for a better frame will often save the operator hundreds.

The relationship of wheelbase, cab to center of rear axle distance, frame size and balance of loading space should have more attention.

As for engines, it is my experience that the following types and sizes of engines are best adapted under our road conditions for our various services:

(a) In heavy-duty trailer service of 68,000 lb. gross (the heaviest permitted on California highways without special permission), the engine should be about 500 cu. in. displacement with maximum torque at 1000 to 1400 r.p.m.; maximum power at 2400; best duty, considering life and operating cost, at 2000, and best economy at 1500 r.p.m. An auxiliary transmission will permit high speeds when running light or on level roads with slow engine speeds, and will insure use of direct drive when pulling, except on steep grades.

(b) In heavy-duty service without trailer the same type of engine with 425 to 450 cu. in. displacement could be used nicely.

(c) For work up to about 25,000 lb. gross a 360 cu. in. engine of the same type would do.

(d) For four-wheel vehicles with duty up to 20,000 to 22,000 lb. gross, a 325 cu. in. engine is adequate. However, as a substitute, a 280 cu. in. passenger car engine capable of 1000 r.p.m., greater speeds may be considered if used with a slower speed rear axle to give greater tractive effort on steep grades and about the same top speed. I think that over a period of 150,000 miles the latter engine would cost more for upkeep on account of faster ring and piston speeds and the inclination of the driver to put on classier performance with flashy pick-up.

(e) Below the 20,000 lb. gross class the engine out of any passenger car of a power and speed proportionate to gear ratio and tractive effort required over the route to be traversed will serve. For city work and for service in short outlying districts, a rebuilt passenger car will do.

(f) Vehicles to carry heavy loads slowly for short distances might be tractor-trailer outfits, or a low-ratio truck with a fairly small engine not specially built for this work. While one of the other types of trucks could be used economically for this work intermittently for permanent duty, a tractor with pneumatics and semi-trailer would be best.

FRANK A. ROSE,
Fleet Operator.

More About Diesel Fuels

Editor, AUTOMOTIVE INDUSTRIES:

The letter of Robertson Matthews, in *Automotive Industries* of Nov. 14, entitled "Preheating Fuel for Injection Engines," was quite entertaining.

I will agree with him that heating complex fuels requires the use of some gumption. This question is always overemphasized because of lack of care in analyzing the actions occurring, in such heating, and the effect of time. Of course it would not do to heat "just any old way."

It is well known that combustion of the fuel in precombustion engines occurs after injection. It was not necessary to mention the fact.

As for intake strokes of fuel valves, I trust that Mr. Matthews has somewhat more ingenuity than he attributes to me. The matter has received full consideration and is duly covered in the usual manner.

I apologize for letting the statement "evaporation started on ignition" get by me; it should read, of course, as reference to the original report would have shown, "Evaporation started on *injection.*" As Kurt Neumann and others have shown, evaporation does occur before burning commences, though the fraction of the fuel drop evaporated before ignition is small, of the order of a very few per cent. The second statement quoted, "Vaporization proceeds as fast as the fuel can be burned," refers to the combustion process after ignition occurs. It may not be scientifically correct. Before ignition, heat for evaporization is obtained from the air for combustion and not much (relatively) is available. After ignition, the heat for evaporation comes largely from the heat of combustion, for combustion occurs not far from the liquid droplet, the distance and the amount of combustion being governed partly by the accessibility of oxygen to the vapor envelope. Combustion of vapor and oxygen is rapid; large

amounts of heat for evaporation (relatively) are available. There is a sort of balance between the vapor formed and the vapor burned, and this was the thing which serves as the basis of my statement.

Really I fail to see how any one, reading at all carefully, in spite of the admitted error above, could have failed to understand that I distinctly accept the viewpoint that vaporization plays a part, and a most important part, in the combustion process. Several paragraphs were devoted to a brief statement of the significance of burning points, etc. I distinctly had in mind the erroneous conclusion "—concludes that vaporization plays no part in either the ignition or combustion in Diesel engines—" when I spoke of "the significance of the findings" escaping the research worker and engineer.

The last paragraph of Mr. Matthews' letter on "paths by which carbon can pass into carbon dioxide" seems to have been taken out of the atmosphere, as I realized in writing that the exact chemical reaction could be overlooked, and took special pains to avoid reference to any special path. If Mr. Matthews is really sincere in his statement, "To mechanical engineers it is probably of more importance to know how oil should be burned for best results in an engine," he will reread my letter and look up the references and any others he can find, and think them over. I speak as a mechanical engineer who has found the combustion process sufficiently important to him to warrant gaining the necessary chemical and physical knowledge. Chemistry includes such things as rates of reaction, the importance of surface area exposed to reaction, masses of reacting substances present, the statistical theory leading to an understanding of the effect of temperature on the rate of reactions, and others which can be applied substantially without reference to the exact chemical reactions occurring. Without such studies, the mechanical engineer cannot hope to "know how oil should be burned." The history of the last twenty years is filled with examples of the value of applying such methods to combustion processes. Improvements in boilers and engines could not be intelligently planned until the nature of the process had been studied further than a plain mechanical engineer with only elementary chemistry could possibly study it.

During the last few years I have had numerous occasions to note how carelessly men whom we should like to regard as specially competent carry on their reading and thinking. Mr. Robertson Matthews' letter is merely one example in a long list I could quote. It is an attitude of mind which delays progress and cannot be too severly condemned. It is more important, I feel, to urge careful reading and thinking than merely to make my own ideas clear and defend them.

I should indeed be ungrateful if I did not thank Mr. Matthews for his letter, for I think I am correct in assuming he may be regarded as "skilled in the art." His letter is valued testimony to the fact that certain ideas of mine constitute invention, as contained in his statement—"It is possible that Mr. Richardson has overlooked, etc." If he cannot supply certain simple conditions, obviously my supplying of them constitutes invention. Of course, I have confined myself to principles only and not to inventions in writing these letters.

EDWARD ADAMS RICHARDSON.

Regarding Streamlined Bodies

Editor, AUTOMOTIVE INDUSTRIES:

I was interested in your comment in a recent issue of *Automotive Industries* on the timidity with which the industry was approaching the streamlined car. I also remember an article appearing at some time previous extolling the leaders of the industry for the part they were playing in the relief of unemployment.

I wonder how much of this praise was deserved. Does it not occur to you that in their timid advances toward the car which they, for the most part, believe will be ultimately standard, they have passed up an opportunity to do more than any other industry is capable of doing to relieve the present situation? In place of lauding them, I feel that you should bring them to task for passing up a golden opportunity to be of service.

For the most part, the 1932 improvements are of a minor nature, do not materially change the appearance of the cars, and appeal more to men than to women. You and I and our next door neighbors are not going to buy a new car this year if the old car is not too objectionable to the family, and as it does not differ materially in appearance from the 1932 model it probably will suffice. Suppose, however, that all or practically all of the 1932 cars were of the tear drop version and a quite radical departure in appearance from the 1931 models. There would be some sold, as there will be some of the present new models. The old bus would then be definitely a back number, obsolete and unsatisfactory to the family. Unless purchase of a new car were entirely out of the question, due to an absolutely flat pocketbook, you and I and our next door neighbors would have to buy regardless of personal feelings.

I will grant that it would have required real courage on the part of any one manufacturer to make such a radical change and would probably have been a useless and fatal step. But what of cooperation in the industry? Would it not have been quite possible and quite good business for the leading manufacturers to have agreed to discontinue the old body lines and adopt the fully streamlined type? Or if they could not agree on this type, to find some radical change in appearance on which they could agree? This would not have required Spartan courage—only a spirit of cooperation in an effort to relieve a distressing condition. To me this seemed to be such an obvious step that I confidently looked forward to seeing it accomplished at the New York show and as the announcements of the new cars have come out showing only timid advances I have not only been sorely disappointed but my faith in the leaders of this great industry has been considerably shaken.

J. H. GEISSE.

Polishing Chromium Plate

Editor, AUTOMOTIVE INDUSTRIES:

The short paragraph on page 723 of the Nov. 7 issue of *Automotive Industries* (Production Lines) contains a statement about chromium plating which cannot be too strongly emphasized.

Experience in many plants has shown that there is a certain minimum amount of polishing which must be done if quality is not to be sacrificed. The law you have stated, that the quality of the finish is dependent upon the number of wheels used, has been proved time after time.

Your emphasis of this important matter is commendable, and is in line with the tendency of the automotive industry to seek more durable finishes.

LOUIS WEISBERG.

Production Lines of the Industry No. 7. Trimming door panels in one of the finest trim shops in the automobile world—the Dodge trim plant. For full details of the plant and its work see Automotive Industries, page 789, Nov. 29, 1930.

PRODUCTION LINES

Briquets for the Foundry

The latest in "Electromet" is a variety of briquets of ferro-manganese, ferro-silicon, and ferro-chrome. Each contains a definite amount of alloying elements by weight. Castings are said to be greatly improved in quality by these additions. The cement binder used protects the ferro-alloys from oxidation until they reach the hottest zone.

Radial Truing

Radial truing is an important factor in accurate grinding work, according to an article which you will find in *Grits and Grinds* for December, 1931. This is particularly important in grinding crankshafts where well-rounded corners and fillets are required.

Prompt Service

Right down our alley is the announcement in *Grits and Grinds* for December, 1931. It says that a complete stock of service parts is always on hand for Norton machines. Seventy per cent or better of replacement orders are shipped within 24 hr.

Polishing Pioneers

Many experts admit that metal polishing is still a pretty unstable and unstandardized art. It just grew like Topsy. And everyone has his own way of doing it. It's good to know that over at the University of Michigan, impressive tests are under way to get some science into the thing. More power to them.

Lighter Than Air

We learn from *Oxy-Acetylene Tips* for January, 1932, that much of the framing of the dirigible Akron is joined by means of gas welding. As part of the regular equipment, the ship carries ten small oxy-acetylene welding units for emergency repairs while in flight.

Facilitates Repairs

Tobin bronze has a low melting point which enables it to bond easily with many metals. Thus its use has grown in gas welding for general maintenance needs. One money saver is the repair of fractured foundry flasks. Another is the repair of large castings such as are found in Diesel engines.

Vent With Copper

Makers of gas-fired unit heaters now recommend copper pipe for venting products of combustion. For special purposes, vent and flue pipes of nickel-plated copper are furnished.—From *Anaconda News*, January, 1932.

Greeks Have It

According to *Commerce Reports*, No. 3, 1932, eight or ten establishments in Greece are making practically all automobile and truck springs required there. Total yearly requirements of all sizes estimated at 45,000 springs. Imports are practically out because of prohibitive duty on spring bar stock and finished product. Quality of the home-made product is said to be far inferior to American.

Practical Economy

The economy of brass for certain screw machine parts is discussed in *Anaconda News*, January, 1932. While brass is more expensive than steel, it provides better machining qualities and permits higher speeds and feeds. It is also claimed that tool life is almost five times greater with brass work. If parts are to be plated, it can be done directly on the brass.

Resists Abrasion

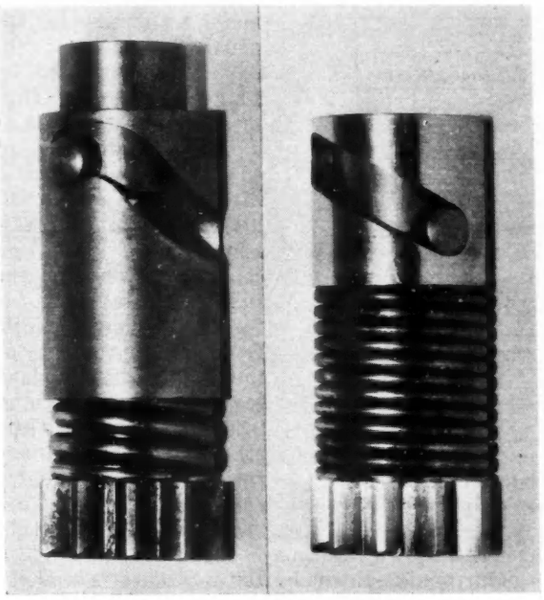
Promal, a metal originally developed for making Link-Belt cast conveyor chain, is now available for general use. It is a strong material, long-wearing due to a high degree of resistance to abrasion. A new booklet No. 1250, describing applications and characteristics, may be had on request.

For Low Temperature

Some interesting ovens for low temperature drying have been built recently by Drying Systems of Chicago. You'll find a variety of designs for automotive needs in Bulletin No. 400. They range from drying wood veneer to complete bodies.—J. G.

MANUFACTURING MANAGEMENT METALLURGY

Abell Starter-Drive Cushions Shock of Engagement; Safe From Backfire

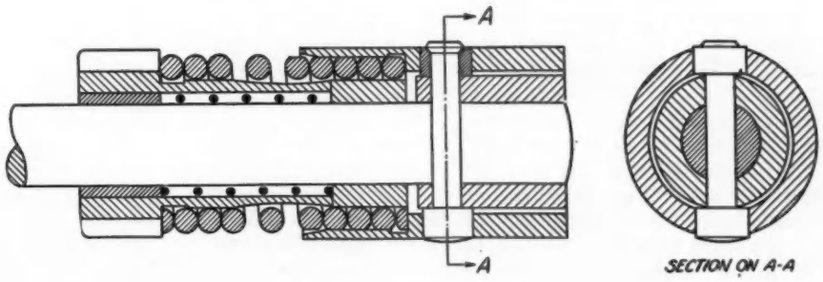


Abell starter-drives with inside and outside springs respectively

AN automatic starter-drive in which the contracting-expanding coil-spring clutch principle is used to cushion the engagement shock and to serve as a protection against backfiring has been developed by Rollin Abell of the Abell Drive Co., Mattapan, Mass., and is being offered to electrical equipment suppliers of the automotive industry.

In this drive, the cam and pinion are connected with a torsion spring having a large number of coils, this spring having no loops or bolts, but locking mainly through friction. In one form of this drive, the spring locks inside cups at both ends. In the other, it locks externally. Round wire is used in the first case, with the center coils separated for flexibility. In the other design, a flattened wire spring with a greater number of turns than is possible with the round type is used.

In the first design, illustrated herewith in section, the spring is compressed into the end of the cam, which is of tubular form.



Abell starter-drive with inside spring in section

There is also an internal recess in the cam into which the end coil of the spring expands, locking it against endwise motion, at the same time allowing it to rotate in case of an overload or backfire. The amount of oversize in the normal diameter of the coil spring is determined by the pressure necessary to produce a clutching action in excess of the normal stall torque of the starter motor. In the normal operation of some starters, however, there is an instantaneous torque set up at the instant of engagement in excess of the normal stall torque, due to the inertia of the armature. Under this overload, the spring clutch slips to provide a shock-absorbing action. It will be noted that the design of the cam is such as to effect engagement in approximately one-third of a revolution of the starting motor to prevent excess build-up of armature inertia.

It will be noted that the cam is assembled on the armature shaft by means of a trunnion pin instead of the more usual Woodruff key and set-screw or locking device. This trunnion pin is ¼ in. in diameter, having a head on one end and a bushing on the other, slipping over the small end of the pin, which is then expanded with a center punch to lock the bushing. The trunnion pin thus serves the dual purpose of a key and cam-actuating trunnion. Optionally, a pocket can be provided at the end of the cam path into which the trunnion pin drops, to form a flexible-locking mechanism, preventing the disengagement of the pinion from the flywheel in case of a false start. As soon as the engine speeds up under its own power, however, the pin will jump out of the pocket and automatically disengage the pinion. A light anti-rattler spring is used inside the pinion to prevent it from jarring against the flywheel.

The starter drive is simple in construction. Its weight is approximately twice that of the usual assembly, and this is considered a desirable feature for cold-weather starting, due to the increased inertia of the assembly.

The Abell Drive Co. states that on account of its design this drive can be furnished with a nine-tooth pinion and used to replace any manual shift design without change in the starting motor. It is stated that the features of these drives are covered by patents issued and pending.

Nickel Tubing Resists Fatigue

by Robert Worthington
International Nickel Co., Inc.

FATIGUE tests recently made on nickel tubing have given results of interest in their application to the aircraft fuel line problem. Annealed copper tubing is commonly used for fuel lines because of comparative low cost and ease of maintenance. In most cases the strength of copper in fatigue, though relatively low, is sufficient for long life, yet occasionally fuel lines fail from over-stressing. Greater fatigue resistance in fuel line tubing lessens the chance of fracture when unexpected and unavoidable over-stressing does occur. Nickel tubing is so much stronger than copper tubing, as indicated in Fig. 1, that what would be excessive over-stress for copper would still be within safe limits for nickel. It is recognized, however, that over-stressing of any fuel line to this degree should be eliminated by properly supporting the line.

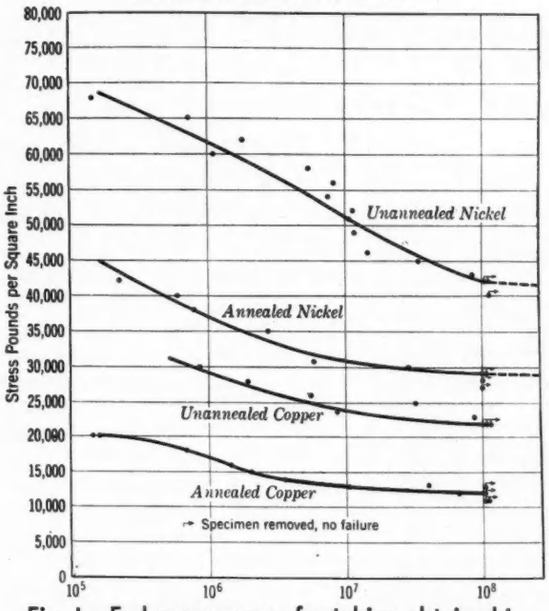


Fig. 1—Endurance curves for tubing obtained in tests by the U. S. Army Air Corps, Wright Field

High strength in fatigue is without doubt the desirable property for fuel line tubing. Both the Bureau of Aeronautics of the Navy Department and the Army Air Corps have made comparative fatigue tests on nickel and copper tubing, and both have found the strength of nickel considerably higher. In Fig. 1 are given fatigue curves for nickel and copper, both in the annealed and unannealed conditions, as determined by the Army Air Corps. The nickel tubing as tested had a ground surface, whereas the copper was "as drawn." According to the figure, stresses from 12,000-14,000 lb. per sq. in. to 28,000 lb. per sq. in. will ultimately cause fracture of annealed copper, yet this whole range lies below the fatigue limit of annealed nickel. The same relation between the metals holds true in the case of unannealed tubing.

Results of tests in the vibration machine confirm these relations between nickel and copper. Specimens of annealed nickel tubing tested by the Bureau of Aeronautics of the Navy Department had an average life of 40 hours and 45 minutes, whereas copper had an average life of 5 hours and 30 minutes. At the Material Division, Air Corps, during tests, annealed nickel lasted 21 hours and 18 minutes (single test), unannealed nickel 91 hours and 46 minutes, and copper had an average life of 8 hours.

The vibration test is a modified, more or less crude, and limited fatigue test. Actually a single life-to-failure result from a vibration test corresponds to a single point on a fatigue curve. An important difference between the two tests is that the degree of flexure in the vibration test is independent of the inherent elastic stiffness of the metal, whereas in the usual fatigue test the flexure is controlled by this stiffness. Thus in the vibration test a low modulus of elasticity favors a high life-to-failure value. The vibration test approximates service conditions where the tubing installation is forced to flex by differential movement of the parts of the plane to which the tubing is attached. On the other hand, the ordinary fatigue test simulates conditions causing "whipping" of the tubing through its own inertia.

The point made evident by the test data is that, in either set of conditions, nickel is quite considerably stronger than copper.

Unannealed metal is far stronger in fatigue than annealed metal. That annealed metal is more commonly used for fuel lines is due to two facts—its greater capacity to take bends without fracture (ductility), and the greater ease with which it is bent by hand and can be flanged for the application of fittings. The ease of flanging copper tubing without injury to the surface is one of the principal reasons for its extensive use. It is erroneous to think that tubing, to be strong in fatigue, must be annealed after bending or that periodic annealing of the fuel lines on an airplane will give them longer life in fatigue.

Unannealed nickel as commercially furnished has actually a good degree of ductility, as indicated by the data given below:

Per cent Elongation in 2 in. (Army Air Corps Tests)	
Annealed nickel	48.5
Unannealed nickel	9.5
Annealed copper	56
Unannealed copper	4

This tubing can be given rather drastic bending treatment without fracture, but the superior toughness of nickel makes flanging more difficult. Having the ductility required for installing, its high fatigue strength in service would supply a very large factor of safety over copper. Annealed nickel tubing, although stiffer than annealed copper, is sufficiently soft to permit a satisfactory installation by the methods now employed for copper. Where tubing in installing must be bent over a small radius, annealed nickel is as suitable for taking the bends as annealed copper; its behavior, once installed, will be distinctly better.

Ricardo Adds Chapter on High-Speed Diesel Engines

— Other Book Reviews

The High-Speed Internal Combustion Engine

By Harry R. Ricardo. Second Edition. D. Van Nostrand Co., New York.

The chief difference between this second edition and the first is the addition of a chapter on high-speed Diesel engines. Since this is a field in which the author has been quite active in recent years, he writes on the subject with authority, the same as on the gasoline engine, to which the bulk of the book is devoted.

Ricardo's The High-Speed Internal Combustion Engine, is a strictly technical work dealing particularly with the fundamentals of engine design. It covers a rather wide field, including engines for road vehicles, aircraft, and military tanks. Carburation and ignition are also dealt with. The breadth of the field covered, obviously made it necessary for the author to confine himself to the more fundamental problems, and detail problems of design are dealt with rather briefly. Most attention is paid to those subjects, such as that of detonation, and influence of form of combustion chamber, on which the author himself has done notable research work.

As compared with the first edition, this second edition contains additions rather than alterations, for, as the author points out in his preface, progress has to a large extent followed along the lines foreshadowed in the original volume, published in 1923, which also dealt mainly with general principles rather than specific designs.

Handbook of Business Administration

W. J. Donald, editor-in-chief, McGraw-Hill Book Co. 1753 pp., $7.

Sponsored by the American Management Association, this handbook is designed to give executives the same type of ready reference as engineers have had for many years. Its scope broad and ambitious, comprises six sections: marketing, financial management, production management, office management, personnel management, and general management. Following the practice so successful in technical handbook design, individual chapters in each section are contributed by specialists in the field. Thus to cite just a few, we find such names as: Lillian M. Gilberth, C. W. Lytle, R. S. Perry of Ingersoll Milling Machine, Glenn A. Bowers, H. V. Coes and George T. Trundle, Jr.

English-Spanish Automotive Dictionary

By Maximilian Aviles. Published by Business Publishers International Corporation, New York.

This is a glossary of known and generally accepted Spanish equivalents for individual English words, and it also contains translations of phrases, and definitions where these were considered necessary to give the reader an adequate meaning of the subject. In some cases it was necessary to give several Spanish equivalents for an English word because of territorial differences of usage. For instance, rubber is known as *cauch* in most Spanish countries, but the old Castilian form is *goma* or *goma elastica*, while in Mexico it is known as *hule* and in Peru as *jebe*. The author, who has done all of the translation work of a Spanish automobile periodical published in this country for about 10 years past, has certainly had an excellent training for the preparation of such a dictionary.

The Influence of Drill Holes on the Endurance Limit of Steel Rods

Der Einfluss von Bohrungen auf die Dauerfestigkeit von Stahlstaeben. By Dr. Ing. G. Barner. Published by V D I Verlag, Berlin NW-7, Germany.

This is a report of a research undertaken to determine how the endurance limit of steel test specimens is diminished by drill holes in the specimen. Tests were made on three kinds of steel, viz., low carbon steel of 58,500 lb. p. sq. in. tensile strength, high-carbon steel of 84,000 lb. tensile strength and alloy steel of 74,000 lb. tensile strength, and the tests were made in two kinds of endurance machines, a pulsating tensile endurance machine and a bending machine. All results are expressed in percentages of the static tensile strength of the material. The report also contains a review of work by other investigators on the same lines.

Automobiltechnisches Handbuch

Thirteenth Edition. Richard M. Bussien, editor-in-chief. Published by M. Krayn, Technischer Verlag, Berlin W.

The thirteenth edition of Krayn's well-known handbook of automobile design gives evidence of a very thorough revision. It is set completely from new type, and the majority of the illustrations are clear and sharp. The rapid development of automobile design in recent years compelled a complete rewriting of the work, and to make room for the additional material, the use of smaller type was resorted to. New chapters in this edition include the following: Economics and Cost Determination in the Operation of Automobiles, Motor Vehicle Tests and Valuation, Independent Suspensions, Two-Stroke Engines, and Front Drive. The book covers the entire field of automotive engineering with the exception of aircraft. There are chapters on motor boats, tractors, electric vehicles, etc.

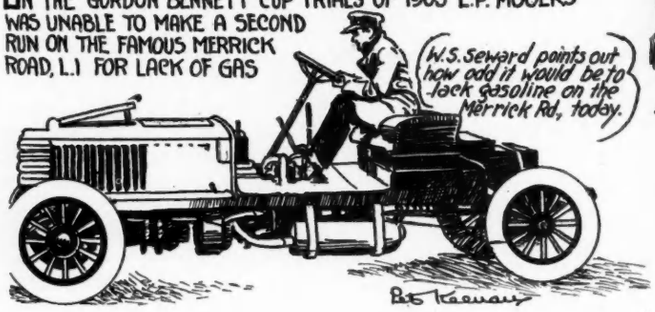
Automotive Oddities—By Pete Keenan

IN 1834 A HOSTILE PUBLIC WITH THE CRY OF "DOWN WITH MACHINERY" STONED THE HORSELESS CARRIAGES.— DUG TRENCHES AND PLACED OBSTACLES ON THE ROAD TO TRAP UNSUSPICIOUS DRIVERS.

E.H.LEE HAS FLOWN 1,309,900 MILES. HE GIVES A TALK ENTITLED "THE FIRST MILLION MILES ARE THE HARDEST"

A THREADED NUT 1900 YEARS OLD IS IN THE BONN MUSEUM GERMANY.

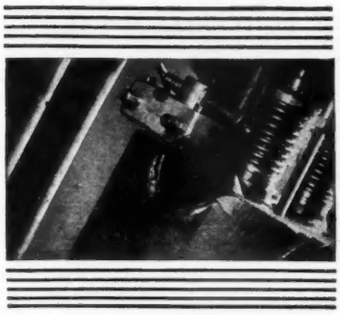
IN THE GORDON BENNETT CUP TRIALS OF 1903 L.P. MOOERS WAS UNABLE TO MAKE A SECOND RUN ON THE FAMOUS MERRICK ROAD, L.I FOR LACK OF GAS



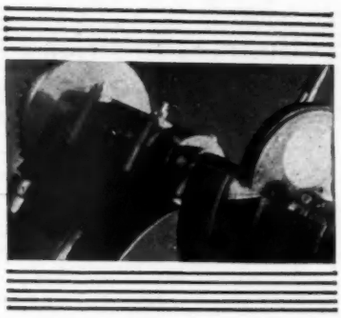
LEON BOLLEE, THE NOTED FRENCH ENGINEER, WHOSE FIRST CAR MADE FORTUNES FOR SONG WRITERS AND THEATRE MANAGERS WHO BURLESQUED IT IN PARIS.

Do You Know An "Oddity"?

Correspondence about "Automotive Oddities" is invited. Contributions used will receive editorial mention when practicable. If you are interested in the source of, or the reason for, a particular "Oddity," ask the editorial department of Automotive Industries about it.



NEWS OF THE INDUSTRY



G. M. Holdings of Cash Increase

Earnings Report for 1931 Reflects Revaluations

NEW YORK, Jan. 27—General Motors Corp. in a preliminary report for 1931, subject to final audit, shows net earnings for the year of $115,089,701. This is equivalent, after preferred dividends, to $2.43 a share on common stock and compares with total net earnings for the previous year of $151,098,992, or $3.25 a share on common stock.

After deducting from earnings extraordinary non-recurring losses, net earnings for the year amounted to $96,858,701, or $2.01 per share on common stock. These extraordinary losses include provision for contingent losses resulting from the revaluation of the company's investment in net working capital abroad affected by depreciation in foreign currencies, and from revaluation of the General Exchange Insurance Corp. security investments, all written down to market value as of Dec. 31, 1931.

Cash, U. S. Government and other marketable securities at Dec. 31, 1931, amounted to approximately $204,835,000, compared with $179,037,071 on Dec. 31, 1930.

Durant Gets Receiver

LANSING, MICH., Jan. 27 — The Federal District Court in Detroit has named the Central Trust Co., Lansing, as receiver for Durant Motors of Michigan, manufacturing and sales subsidiary of Durant Motors, Inc., a Delaware corporation.

TOLEDO, Jan 27 — Receivership of the Durant Motors of Michigan, petitioned for by City Auto Stamping Co. here on the basis of its judgment of $41,161 in local common pleas court, is a friendly move to continue operation of the plant for benefit of all creditors and stockholders, it was announced here by the Toledo company.

Wide Development of Low Pressure Tire Indicated by Musselman

CLEVELAND, Jan. 28—A new low-pressure tire for passenger cars which contains all the essential characteristics of the doughnut type of airplane tire now in general use and which employs an entirely new principle of hub construction was announced yesterday by A. J. Musselman, of Cleveland, its inventor.

The new tire has already been turned over to the principal manufacturers, including General, Firestone, Goodyear, Goodrich, U. S. and Seiberling who are now engaged in various stages of its manufacture and distribution. These companies, however, have not yet made any public announcement of their possible joint intentions for marketing it.

The Musselman hub which is being manufactured to accommodate the new type of tire is of the demountable type and is built into a combination of hub and rim and contains no spokes.

Several of the tire manufacturers, however, are manufacturing tires for a drop center type of hub. Mr. Musselman claims that the drop center type is not as expedient insofar as the car owner is concerned, because of the increased difficulty encountered in changing the tire and because of additional wear in removing the tire from the rim.

Musselman predicts that universal use of his new tire principle will bring about revolutionary changes in passenger car construction, especially as it relates to spring construction and the use of shock absorbers.

G. M. Counsel Pleads for Publicity on New Patent Applications

WASHINGTON, Jan. 28 — Patent applications should be open to public inspection for three years after they are filed, in the opinion of G. H. Willetts, patent counsel of the General Motors Corp., who appeared as a witness yesterday before the House Committee on Patents. His testimony was part of extensive hearings which are now under way to determine need of amendment to the existing patent laws.

Mr. Willetts contended that, under the present system of secrecy of applications, many hardships are thrust upon both inventor and manufacturer. The latter, it was pointed out, are unable to learn of applications which they may have unconsciously infringed.

G.M. Sets Up New Sales Co.

N. W. Grouping Will Follow S. E. Lines

NEW YORK, Jan. 26—A subsidiary company similar to the S. E. Sales Co. is being organized by General Motors in Montana, *Automotive Industries* has learned from unofficial sources. The S. E. Sales Co. (see *Automotive Industries*, Jan. 2 *et seq.*) was set up to handle the distribution and dealer contacting of Buick, Pontiac, Oldsmobile and Cadillac cars in the southeastern states. The new company, to be known as the N.W. Sales Co., in addition to these lines will handle Chevrolet, and will confine its activities to states in the Northwest.

In both areas covered by the two new companies, the head of the company is responsible directly to R. H. Grant, vice-president of the General Motors Corp. in charge of sales. Both companies are intended to eliminate duplication of factory sales effort in territories where sales are relatively light. Another intention is to strengthen the position of individual dealers by offering multiple G.M. franchises where conditions warrant.

Takes Carriers Case

WASHINGTON, Jan. 28—Chief Justice Hughes has announced that the Supreme Court of the United States will hear the appeal case relating to the validity of the new Michigan law regulating private contract motor carriers. The case has come up from the United States District Court for the Eastern District of Michigan which upheld the act and said it did not undertake to regulate the business of private motor carriers but covered their operations upon the Michigan state highways only. The case is known as that of Ogden & Moffett, et al., against the Michigan Public Utilities Commission.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

NEW YORK, Jan. 27—The unusually mild weather in many sections of the country has appreciably retarded retail business in winter lines, and special clearance sales in these seasonal goods have not been highly satisfactory. Wholesale buying in a few lines has been more encouraging, but this branch of trade as a whole is below expectations.

GUARANTY INDEX

The Guaranty Trust Company's preliminary index of business activity for December stood at 58.8, as against 57.9 for November and 74.2 a year ago. The Guaranty Trust Company's index of wholesale commodity prices on January 15 stood at 43.1, as against 43.1 a month earlier and 55.5 a year ago.

CHAIN STORE SALES

Sales of 38 store chains during December totaled $317,695,747, as compared with $342,696,249 a year ago. Sales of three mail order houses during December totaled $57,711,857, as against $71,272,220 a year ago.

ELECTRICITY OUTPUT

The output of electricity by the electric light and power industry in the United States during the week ended January 16 was 6.7 per cent below that in the corresponding period last year.

CONSTRUCTION CONTRACTS.

Construction contracts awarded in 37 Eastern States during December totaled $136,851,600, as against $249,435,500 a year ago, according to the F. W. Dodge Corporation.

CAR LOADINGS

Railway freight loadings during the week ended January 9 totaled 572,504 cars, which marks an increase of 69,179 cars above those during the preceding week, a decrease of 140,624 cars below those a year ago, and a decrease of 289,957 cars below those two years ago.

MERCHANDISE EXPORTS

Merchandise exports during December totaled $184,000,000, as against $274,856,000 a year ago. Imports amounted to $153,000,000, as against $208,636,000. Foreign trade during 1931 resulted in an export balance of $334,076,000, as against an export balance of $782,273,000 a year ago.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended Jan. 23 stood at 65.2, as against 65.2 the week before and 65.3 two weeks before.

BANK DEBITS

Bank debits to individual accounts outside of New York City during the week ended Jan. 20 were 21 per cent below those a year ago.

STOCK MARKET

The upward trend of the stock market during the preceding few weeks did not continue last week. The lack of progress in the negotiations for a reduction in railway wages and further dividend reductions and omissions are regarded as the chief causes of the turn in the market. The volume of trading was light, and most issues closed the week with net losses.

RESERVE STATEMENT

The consolidated statement of the Federal Reserve banks for the week ended Jan. 20 showed practically no changes in holdings of discounted bills and in holdings of Government securities. Holdings of bills bought in the open market decreased $26,000,000. The reserve ratio on Jan. 20 stood at 67.3 per cent, as against 66.9 per cent a week earlier and 65.5 per cent two weeks earlier.

Rockne May Enter U. K.

LONDON, Jan. 7 (*by mail*)—Enquiries here as to whether Studebaker Distributors, Ltd., planned to import the Rockne, latest product of the Studebaker Company, have drawn from Mr. H. G. Henly, managing director, the statement that the company is considering importing the Rockne for sale in the British market. However, such a step is necessarily postponed until such time as sterling exchange improves.

"The same remarks apply to the Studebaker trucks," writes Mr. Henly. "Before we went off the gold standard we were doing very well with these trucks, but from the time the government changed its policy the business has taken a downward turn."

Ford "Midgets" to England

DETROIT, Jan. 27—Shipment of 12 "midget" cars from the Dearborn plant of the Ford Motor Co. to the Dagenham, England, plant of Ford Motors, Ltd., has been reported by the *Michigan Manufacturer*. Inquiries by *Automotive Industries* brought unofficial confirmation of the belief that these cars are designed as production samples for the English plant of a type of car which would compete directly with Austin and MG in British markets. The cars are said to have a wheelbase of approximately 80 in., and to be powered by a V-type four-cylinder engine. The possibilities inherent in such a car are believed to be of particular interest in view of the article, "Double or Lose Seen as Answer to Ford in Europe," which appears in this issue of *Automotive Industries*.

Rubber Shipments Steady

NEW YORK, Jan. 27—Shipments of crude rubber from the Dutch East Indies for December, 1931, were 23,940 tons, as compared with 23,883 in November and 22,277 in December, 1930, according to the Rubber Exchange of New York, Inc. Total shipments for 1931 are 284,199 tons, compared with 268,528 tons during 1930.

James D. Sutherland

James D. Sutherland, assistant to the president of the Wyman-Gordon Co., died at New Haven, Conn., Jan. 26. He had been in ill health for several months.

In 1913 he became general sales manager of the Wyman-Gordon Co., which office he held until a few months ago.

Bendix Meeting Postponed

CHICAGO, Jan. 26—Meeting of directors of the Bendix Aviation Corp. has been postponed to Feb. 29, at which time directors will consider maintenance of the current dividend rate of $1 a share annually.

Steel Buying Remains Cautious

But Marked Rise In Demand for Steel is Apparent

NEW YORK, Jan. 28—While automotive commitments for rolled steel continue to be placed with considerable caution on the part of motor car manufacturers as well as parts makers, further gains in the operating rates of Youngstown, Cleveland and Chicago district steel mills were made possible this week as the result of specifications received from automotive consumers. News of the going into partial production of a new $10,000,000 strip mill of the leading Chicago district "independent" comes as a reminder that 1931 construction added 4,000,000 tons to the country's steel-making capacity.

There has been marked improvement in the demand for strip-steel, both hot and cold-rolled. Mills are now able to operate at 25 per cent of capacity, which, light as it may seem in comparison with periods of normal activity, represents a decided improvement over conditions toward the end of last year. Taking it all in all, sheet mills are able to utilize between 25 and 30 per cent of their capacity. The market for strip-steel may be said to have firmed a shade while that for sheets continues rather plastic.

In the Detroit market 2.80 cents, Pittsburgh, is freely quoted on automobile sheets, but some rollers will not take business at that price level. Black sheets are easier, with 2.15 cents, Pittsburgh, the base quotation named by quite a number of mills. Wire products prices are holding steady. Some consumers are protected on their steel bar requirements on a 1.50 cents, Pittsburgh, basis, while fresh inquiries generally elicit a 1.60 cents quotation. Sheet bars have dipped $1 to $27, Pittsburgh, Cleveland or Youngstown.

Pig Iron—The outlook for more active buying by automotive foundries during the next few weeks is considered promising by blast furnace sales agencies. While the Valley pig iron market continues dull, Cleveland and Chicago sellers report better interest among melters.

Aluminum—Somewhat broader demand for piston metal is noted. Final 1931 statistics covering shipments from Canada show that last year's exports from the Dominion were just about one-half what they had been in 1930, the exact figures being 21,539,300 pounds for 1931 and 43,327,800 pounds for 1930. In 1929, exports were 72,970,800 pounds. The market is unchanged.

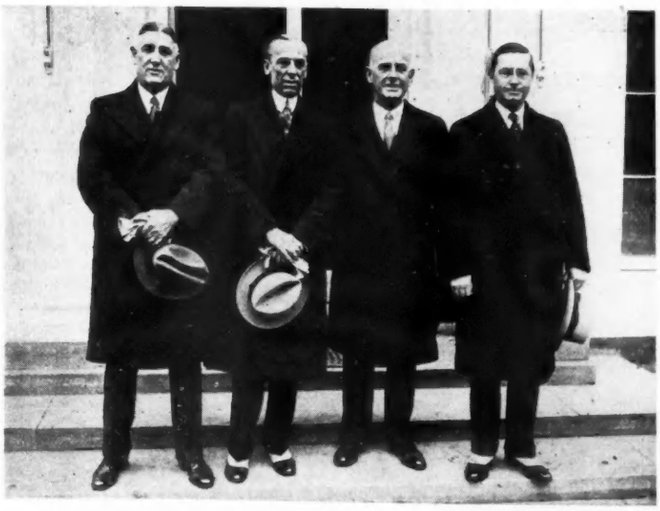
Copper—Dull, with custom smelters and second hands offering metal at 7 @ 7¼c, delivered Connecticut Valley.

Tin—Quiet. Straits was offered at 21¾ @ 22c at the week's beginning.

Lead—Slightly more demand at unchanged prices.

Zinc—Quiet and easy.

Industry Wins First Excise-Tax Skirmish



Below—Left to right: Representatives Charles R. Crisp, of Georgia, and James W. Collier, of Mississippi, are shaking hands with Alvan Macauley, President of the Packard Motor Car Co., and President of the National Automobile Chamber of Commerce.

Left to right the others are: George M. Graham, Vice-President of the Rockne Motors Corp.; Alfred P. Sloan, Jr., President of General Motors Corp.; C. W. Nash, Chairman of Nash Motors Co.; Roy D. Chapin, Chairman of the Board of the Hudson Motor Car Co., and W. C. Cowling, Manager of sales of the Ford Motor Co. (International Newsreel Photos.)

AUTOMOBILE MAGNATES CALL AT WHITE HOUSE

Above, left to right: W. C. Cowling, of the Ford Motor Co.; Alfred P. Sloan, of the General Motors; Alvan Macauley, Packard Motor Co., and Roy D. Chapin, Hudson Motor Co., shown when they left the White House after their visit with President Hoover.

A. C. Pearson, president of the National Publishers Association, and chairman of the United Business Publishers, Inc. (controlling AUTOMOTIVE INDUSTRIES and its affiliated automotive publications), was among the nationally-known executives who officially protested against the proposed sales tax on automobiles to the House Committee on Ways and Means. An excerpt from Mr. Pearson's letter to the Hon. James W. Collier, chairman of the Committee, follows:

"The advertising programs of automobile manufacturers have been projected months ahead based on price considerations which did not include the addition of an excise tax. Forced reductions in proposed advertising expenditures would be disastrous for publishers who are counting heavily on this class of business to lift them from the depression. If cancellations of advertising contracts follow the proposed tax increase, the havoc will be felt far beyond the borders of the publishing industry. Months of preparation which necessarily precede a sales campaign will go for naught and the losses to publishers and others will be incalculable."

by L. W. Moffett

WASHINGTON, Jan. 28—Present indications are there will be no sales taxes placed on automobiles, trucks, accessories and parts. Escape of the automotive and related industries from reinstatement excise taxes seemed assured after leaders of the industry protested before the House Committee on Ways and Means.

There had been signs that the taxes would not be applied and the showing made by industry through the different organizations added greatly to the belief that the committee will turn down the administration request for reinstatement of the 1919 and 1924 taxes. The industry is said to pay about a billion dollars annually in taxes under present laws.

Whatever may be said of politics in Washington, it is clear that Congress is doing everything it can to speed prosperity. When practically the entire automotive industry, as represented by its leaders, came to Washington, to plead against the taxes, Congress took notice.

Seldom has such an array of industrial interests appeared before a committee to plead its cause so assiduously and faithfully as did the automotive interests.

It is not known by the committee itself just what taxes it will assess, but working out of a final draft for legislation is being hurried.

Present proposals which appear to receive majority sympathy by Republicans and Democrats, include a tax of 1c per gallon on gasoline, a consumptive tax on electrical energy, possibly a tax on motor truck freight, though this is meeting with considerable opposition, and higher assessments in incomes, greater surtaxes and added inheritance and gift taxes.

At the hearing the industry's position was presented by George M. Graham, vice-president of the Rockne Motors Corp., on behalf of the National Automobile Chamber of Commerce.

How Motor Vehicles Contributed to Taxes, 1919 to 1931

	Registration Fees	Gasoline Tax	War Excise Taxes†	Personal Property and Municipal Taxes‡	Total*
1919...	$ 64,697,255	$ 1,022,514	$101,138,191	$ 55,000,000	$222,365,681
1920...	102,546,212	1,363,902	149,207,520	60,000,000	315,157,877
1921...	122,478,654	5,382,111	99,967,423	66,000,000	295,604,682
1922...	152,047,824	12,703,078	114,793,400	77,000,000	358,329,922
1923...	188,970,992	38,566,338	155,796,944	88,000,000	473,241,674
1924...	225,492,252	80,442,295	139,201,755	99,000,000	546,150,141
1925...	260,619,621	148,358,087	143,430,709	110,000,000	664,273,492
1926...	288,282,352	187,603,231	96,255,639	126,000,000	698,272,350
1927...	301,061,132	258,838,813	60,473,708	137,000,000	757,373,653
1928...	322,630,025	304,871,766	20,386,176	148,000,000	795,887,967
1929...	347,843,543	431,311,519	.....	149,000,000	928,155,062
1930...	355,704,860	494,683,410	.....	150,000,000	1,000,388,270
1931...	.....	524,000,000	.....	.....	1,022,000,000‡

*Totals include Federal tax on vehicles for hire: 1919—$507,721; 1920—$2,040,243; 1921—$1,776,494; 1922 — $1,785,620; 1923 — $1,907,400; 1924 — $2,013,839; 1925 — $1,865,075; 1926 — $131,128.

†Figures from Bureau of Internal Revenue; War tax removed May 29, 1928.

‡Estimated by N. A. C. C.

Automobile Club of America (N. Y.) Dissolves

NEW YORK, Jan. 27—The Automobile Club of America, oldest automobile organization in the country, has been dissolved after 32 years of service. Originally founded as a social body of automobile owners on June 7, 1899, this club was very active during the early days of the industry in all its phases.

It was patterned after the Automobile Club of France and the Royal Automobile Club of Great Britain. Road racing and touring contests were then the chief means of propaganda; there was need for an organization for the control of such competitions in this country, and it was the plan of the organizers that the Automobile Club of America should perform this function. The club was duly recognized by foreign organizations of similar character and became a member of what is now known as the International Association of Recognized Automobile Clubs.

The first headquarters were at 753 Fifth Avenue, but within a few years the premises there became inadequate and the club then built a large clubhouse on Fifty-fourth Street just west of Broadway. This was an eight-story structure of which the lower floors served for club purposes, while the upper floors served as garage for the cars of members. On the top floor a well equipped testing laboratory was installed, in which some notable engine tests were made.

The first New York automobile show, held in the old Madison Square Garden in 1900, was conducted under the auspices of the club, and it also conducted a number of notable endurance runs.

As interest in automobiles spread, automobile clubs were organized also in other cities, and after a few years these were federated into state automobile associations affiliated with the American Automobile Association. The Automobile Club of America did not join the A.A.A. The Vanderbilt Cup races, the principal automobile road races held in this country, were held under the joint control of the two bodies. But the A.A.A. finally received recognition from the leading foreign clubs as the representative automobile organization in this country.

From that time on the A.C.A. devoted itself chiefly to the interests of its members. For many years it conducted an efficient touring bureau dispensing road information, and it was active in promoting road improvement and favorable automobile legislation in New York State. Among the most notable tests held in its laboratory was an endurance test on a Moline-Knight engine which continued uninterruptedly for a period of 14 days. The club also conducted two contests for commercial vehicles in 1903 and 1904. Its garage service was long considered exemplary.

Having been organized at a time when motoring was a rich man's sport, the dues were always high, and in recent years after the automobile had become accessible to all classes, the membership fell off, with the result that eventually it became necessary to dissolve.

Automobile Club Organized.

The preliminary steps to the organization of an automobile club in New York City were taken at the Waldorf-Astoria Hotel last Wednesday evening, when some thirty persons interested in the motor vehicle responded to the call of Whitney Lyon and George F. Chamberlain.

In his opening remarks Mr. Lyon said facetiously that an automobile club was needed in order to protect users of motor carriages from park boards on the one hand and from motor vehicle manufacturers on the other, the park boards excluding motors from their domains, and the manufacturers keeping purchasers on the string for months.

Mr. Lyon said that the necessity of a club was forced upon him by the difficulty he encountered in trying to find a livery stable keeper who would store and care for his motor carriage. When the proprietor of a stable learned that the vehicle was horseless he looked upon it as an enemy to his business and not to be harbored at any price.

Mr. Chamberlain was elected temporary president, and read the f concise statement of the objects of the organizatic

ressing need of a comm here ve owners of moto ke suitable

1899

"Horseless Age," the first automotive publication in the U.S., ran the story at the left (of which is shown a photographic reproduction) in its June 14 issue.

1932

A lineal descendent of the "Horseless Age" records the dissolution of the A. C. A.

1931 Output Off 29.6 Per Cent

Motor Vehicle Production in December Dropped 23.0%

WASHINGTON, Feb. 4—The United States production of motor vehicles in 1931 totaled 2,389,730 units, the lowest since 1921, when the output was only 861,008, according to the Bureau of the Census. The 1922 production was 2,544,176. The Dec., 1931, production showed a sharp rise to 121,533 from 68,867 in November. The output of last year was distributed as follows: Passenger cars, 1,967,055; trucks, 416,640; taxicabs, 6035.

The 1931 Canadian production was 82,621, also the smallest since 1921 when it was 15,675. The production last year consisted of 63,477 passenger cars and 19,144 trucks. Tabular summary follows:

Production of Motor Vehicles
(U. S. and Canada)

	1931	1930	Change
Passenger Cars			
December ...	98,305	126,483	—22.3%
Whole Year..	2,036,567	2,910,187	—30.2%
Commercial Vehicles			
December ...	25,660	34,840	—26.5%
Whole Year..	435,784	599,991	—27.6%
All Motor Vehicles			
December ...	123,965	161,323	—23.0%
Whole Year..	2,472,351	3,510,178	—29.6%

Wayne Registrations Up

DETROIT, Jan. 27—According to official figures available for the first twenty-three days of January for Wayne county, there has been a 32 per cent gain as compared with new car registrations a year ago, omitting Ford. Licenses have been issued for 1111 new cars in Wayne county as compared with 837 for the same period last year.

Graham Shipments Up

DETROIT, Jan. 27—At the annual Detroit show meeting of Graham dealers yesterday it was announced that new model shipments to date are 58 per cent higher than last year and that dollar value of new Blue Streak already shipped exceeds by 67 per cent value of sixes and eights sold in same period last year.

Detroit Attendance Up

DETROIT, Jan. 28—Total attendance during the first three days of the Detroit automobile show totaled 93,910, which is 40 per cent ahead of the attendance for the first three days of last year's show.

Sterling Reports Loss

NEW YORK, Jan. 27—Sterling Motor Truck Co. reports net loss for the year ended Oct. 31, 1931 as $902,819, compared with $385,580 in the previous year.

E. A. Stinson Killed; Dean of Pilots Headed Company

CHICAGO, Jan. 26 — Edward A. (Eddie) Stinson, president of the Stinson Aircraft Corp. and dean of American fliers, was killed last night when a plane he was demonstrating ran out of gasoline and struck a flag pole in Jackson park, when Stinson sought to land on the golf course. Fred M. Gillies, assistant general manager of the Inland Steel Co., Clarke Fields, Chicago representative of the Stinson company, and John Tompkins, mechanic, were injured in the crash. Stinson died in the Illinois Central Hospital several hours after the accident.

"Eddie" Stinson, born in Fort Payne, Ala., in 1894, inspired by the first Wright flight, built a glider with his brother and two sisters, when he was only 10. ' At 15, Stinson built a glider that took off and carried over 300 feet. He then went to St. Louis, where a plane was under construction. It was the first power plane he had ever seen and after a trip in it he went to Dayton and entered the Wright brothers school. During the world war Stinson was in charge of Kelly Field, Texas. At the close of the war he returned to designing and building planes, establishing a factory in Dayton. Soon after he formed the Stinson-Detroiter Company in Detroit, which has since become a subsidiary of the Cord Corp.

Recognized as a leader in the engineering field of aviation, Stinson was famed for his exploits in the air. His flying hours totaled more than 16,000 and his annual mileage was in excess of 70,000 miles. He was the only pilot to hold two endurance air records and the first flier to emerge alive from a spin. He never sustained a broken bone in a plane accident and never had to leap from a plane in a parachute. His daring as a stunt pilot was known far and wide.

Automotive Industries photo

Mr. Stinson, as he appeared on his last visit to Philadelphia, when he piloted a plane for Auburn executives

Oakland Sold More Cars in '31

And Dealer Profits Were Greater, Blees Reports at Luncheon

Passenger car retail sales of the Oakland Motor Car Co. for 1931 exceeded retail sales for 1930 by 269 units, W. A. Blees, vice-president in charge of sales, announced at a luncheon for Detroit and Flint zone dealers Jan. 26.

According to Mr. Blees, Oakland dealers made approximately $5,881,000 more profit during the past year than in 1930 and used car losses were reduced $14.55 per car. He expressed himself as being anxious to see that trends in these directions would be further carried out during the coming year, stating that the biggest job the industry had today was to see that the dealer got the best return possible on his capital investment.

I. J. Reuter, general manager, Oakland Motor Car Co., in discussing the various dealer problems, said, "If we hired men in our factory organizations the way we hire retail salesmen, we would be lost," referring to the tremendous turnover in dealer salesmen.

The Oakland Motor Car Co. recently announced to its dealers a bonus plan by which the factory would contribute additional remuneration to automobile salesmen as one step in reducing turnover.

Mr. Reuter made the point that there are many good cars and that "organization" has to put over a product today.

Show Brings Out Cheaper, Better Boats

Attendance Up 25 Per Cent at New York Event

NEW YORK, Jan. 27—Lower prices, increased refinements and greater power featured the twenty-seventh Motor Boat Show being held at the Grand Central Palace this week under the auspices of the National Association of Engine and Boat Manufacturers, Inc. Occupying the four exhibition floors of the Palace, the display this year is attracting the attention of approximately 25 per cent more people than did last year's exhibit. Exhibitors almost unanimously indicate greater optimism with dealer orders mounting to higher figures than they have in the past two or three years. Actual retail sales at the show, however, have not been of any great amount.

In the power field, the show contains a greater number of Diesel engines than previously. These range all the way from the large engine designed for the motor yacht down to small Diesels, comparable in size and weight to a four-cylinder automobile engine.

Prices on engines have been scaled down to previously unheard-of levels. Particularly is this true in the outboard motor field where prices are exceptionally low this year. One new development in the outboard field is an engine designed by the Caille Motor Co., with a variable pitch propeller, making possible two forward speeds and reverse. One Diesel shown here for the first time is the Ailsa Craig, a British type which has been in use a long time in England.

Vacuum power operation of clutches and gears are to be found this year in a number of the boats, both in the cruiser class and in the field or runabouts. Shatter-proof glass in windows and wind deflectors is found in more instances than heretofore.

The boats themselves, ranging all the way from the extremely luxurious 50 foot cabin cruiser down to the canoe and "catboat," show many refinements in design and fitting. One new development brought out by the Century Boats, Inc., under the name of air-cushion boat bottom is a hull with a number of longitudinal steps, enabling the boat to start planing after a very short start, and to obtain a high speed.

Straight line production is exemplified in the Dodge boats introduced this year, which are designed to be turned out from the factory in a matter of hours instead of days.

Aaron J. Helfrecht

Aaron J. Helfrecht, chief engineer of the Burgess Battery Co., Madison, Wis., died Jan. 23 after a short illness. He was 40 years of age. Mr. Helfrecht was graduated with a degree in chemical engineering from the University of Wisconsin in 1915 and immediately became associated with the C. F. Burgess Laboratories, Inc. Two years later he was transferred to the engineering staff of the battery subsidiary and was advanced to chief engineer in 1925. He was a member of the American Chemical Society and the American Electrochemical Society.

William B. Johnson

William B. Johnson, for many years superintendent of the drop forge department, Nash Motors Co., Kenosha, Wis., died Jan. 18 from accidental carbon-monoxide poisoning. He was born in Sweden in 1884, came to America in 1901, and joined the Thomas B. Jeffery Co. in 1910. When the Jeffery plant was purchased by the Nash Motors Co. in 1916, he was placed in charge of the drop forge shops.

Exports, Imports and Reimports of the Automotive Industry For December and Twelve Months Ended December, 1931-30

	Month of December				Twelve Months Ended December			
	1931		1930		1931		1930	
	Number	Value	Number	Value	Number	Value	Number	Value
Automobiles, parts and accessories	....	$7,924,622	....	$15,292,403	.....	$146,692,855	.....	$277,427,057
*Electric trucks and passenger cars	....	.....	1	875	.....	.....	34	62,066
Motor trucks and buses except electric (total)	3,333	1,534,912	5,102	3,369,406	48,248	25,101,159	84,513	55,856,160
**Under one ton	1,529	542,060	2,779	1,111,498	7,768	2,683,361	35,375	17,845,474
**One and up to 1½ tons	1,559	676,151	1,986	1,460,373	34,997	15,273,000	44,880	29,116,596
**Over 1½ to 2½ tons	148	173,631	....	.....	3,611	4,173,505	.....	
Over 2½ tons	86	140,980	337	797,535	1,375	2,449,468	4,258	8,894,090
PASSENGER CARS								
Passenger cars except electric (total)	5,753	2,661,221	9,096	5,472,154	82,457	50,007,060	153,069	105,979,545
Low price range, $850 inclusive	5,160	2,063,839	7,213	3,151,602	66,142	31,735,370	111,455	55,545,265
**Medium price range over $850 to $1,200	389	369,460	1,619	1,695,228	9,986	9,581,962	36,292	37,733,362
**$1,200 to $2,000	88	123,753	264	625,324	2,787	3,999,954	5,322	12,700,918
**Over $2,000	28	70,926	....	.....	1,515	3,836,396	.....	
PARTS, ETC.								
Parts, except engines and tires	....	.....	....	.....	.....	.....	.....	.....
Automobile unit assemblies	....	2,003,112	....	3,247,638	.....	39,962,714	.....	61,259,726
Automobile parts for replacement (n.e.s.)	....	1,462,946	....	2,722,543	.....	25,548,126	.....	42,330,187
Automobile accessories	....	153,106	....	329,768	.....	3,216,302	.....	5,542,867
Automobile service appliances (n.e.s.)	....	155,017	....	285,025	.....	3,718,352	.....	5,879,739
Trailers	12	9,474	32	46,704	593	208,155	1,322	648,359
Airplanes, seaplanes and other aircraft	11	41,649	23	261,865	140	1,812,809	321	4,819,669
Parts of airplanes, except engines and tires	....	95,679	....	177,518	.....	1,622,649	.....	2,351,651
BICYCLES, ETC.								
Bicycles	86	2,280	225	5,066	1,434	36,381	3,746	98,538
Motorcycles	109	21,627	230	56,644	5,469	1,302,426	10,262	2,410,412
Parts and accessories, except tires	....	26,625	....	50,247	.....	566,629	.....	955,155
INTERNAL COMBUSTION ENGINES Stationary and Portable								
Diesel and Semi-Diesel	10	41,409	11	67,953	280	386,263	301	991,641
Other stationary and portable								
Not over 10 hp.	407	28,558	715	68,662	7,407	569,974	24,209	1,833,598
Over 10 hp.	61	130,839	66	59,039	4,458	2,264,452	4,105	2,302,481
Automobile engines for:								
Motor trucks and buses	258	31,815	95	23,750	6,034	854,143	19,489	1,635,047
Passenger cars	552	57,345	1,026	85,661	18,953	1,515,839	41,106	3,990,870
Tractors	....	.....	30	16,844	28	6,415	279	122,155
Aircraft	45	194,112	7	11,337	318	1,474,785	376	1,634,885
Accessories and parts (carburetors)	....	108,769	....	174,088	.....	2,124,792	.....	3,329,330
IMPORTS								
Automobiles and chassis (dutiable)	56	48,676	67	52,075	736	769,033	509	875,146
Other vehicles and parts for them (dutiable)	....	4,855	....	2,410	.....	69,552	.....	353,585
REIMPORTS								
Automobiles (free from duty)	9	6,516	21	17,080	268	202,883	332	322,740

*Not shown separately for 1930.
**Classification changes beginning January, 1931.

Rochester Attendance Up

ROCHESTER, N. Y., Jan. 25—The twenty-fourth annual Rochester Automobile Show sponsored by the Rochester Automobile Dealers Association was held Jan. 18 to 23 at Edgerton Park. Officials reported attendance of more than 28,000, an increase of 20 per cent over 1931. Car sales at the show were said to have been 30 per cent greater than those of 1931. Twenty-six passenger car dealers exhibited 27 makes of cars in three large buildings at the park. There were also the usual auxiliary displays of parts and equipment. Arthur C. Lohman, vice-president of the dealers association, was show manager.

Fiat Plans Front Drive

According to reports from Italy, the Fiat company will shortly bring out a new four-cylinder, front-drive car which will sell in the domestic market for less than $1,000. It is also reported that the Italian Government plans to remove the tax from all cars of less than 67 cu. in. piston displacement.

E. G. Grace Flays Proposed Taxation

With a strong insistence that "taxes must come down," Eugene G. Grace, president of the Bethlehem Steel Co., recently told a general meeting of his company's salesmen "the construction, automobile, railroad, and agricultural industries are among our biggest customers. When they thrive the steel industry prospers . . . the motor and oil businesses are threatened by proposed increases in sales taxes.

"Reduce the tax bill, both of the individual and of business, and you will have taken a long step toward restoring confidence."

Stewart-Warner Reports Loss

CHICAGO, Jan. 26—Stewart-Warner Corp. reports net loss of $1,830,171 for the calendar year 1931 compared with net profit of $1,262,278 in 1930, a return of 97 cents a share.

Milwaukee Show Successful

MILWAUKEE, Jan. 25—Milwaukee's twenty-fourth annual show, held at the Municipal Auditorium, Jan. 16-23, attracted an attendance of 91,128, which is approximately the same as a year ago, according to an announcement by Palmer E. Hanson, show manager and executive secretary of the Milwaukee Automotive Trades, Inc. A gross total business for the week of $752,000 is reported. There were more cash buyers than in other years, Mr. Hanson said, adding that one purchaser paid down $750 in bank notes which had a wrapper dated January, 1928. Many others paid in cash instead of instalment.

Frank H. Bogda, of Green Bay, Wis., was elected president of the Wisconsin Automotive Trades Association at the annual meeting held in connection with the show. New vice-presidents are Ralph Hult, Madison; William C. Dicke, Manitowoc, and Charles N. Nash, Wisconsin Rapids. Harry Satterstrom, Appleton, was elected secretary and George Sande, Neenah, treasurer. Lewis Milan of Milwaukee is managing secretary.

Speakers included Don Blanchard, editor of *Automobile Trade Journal.*

International Harvester Adds 3 Models; One 1½-Tonner, and Two 5-Tonners

CHICAGO, Jan. 25—Three additional truck models have been announced by the International Harvester Company, one a 1½-tonner with six-cylinder engine and the other two five-tonners of heavy-duty type. With the addition of the new 1½-tonner the company now has five models of this rating, two with four-cylinder and three with six-cylinder engine. All six-cylinder models carry the same size of engine, a 3¼ by 4½-in. Lycoming developing 54 hp. at 2700 r.p.m. The new A-3 Model is offered at a lower price than the others, $795, and comes in two lengths of wheelbase, viz., 136 and 160 in.

Gasoline is fed by pump from a 16-gal. tank to a Zenith carburetor. Starting, lighting and ignition units are of Delco-Remy make. Power is transmitted through a Rockford plate clutch and Warner-Gear four-speed, unit-mounted transmission to a full-floating, spiral bevel gear-driven rear axle which can be furnished in one or the other of two reduction ratios, viz., 5.285 and 6.16.

The two 5-tonners are similar in design but are equipped with different engines, of 117 and 136 hp. respectively; they also have different rear-axle ratios and different fuel-tank capacities. The engine of Model A-7 has a 4½-in. bore and is capable of developing a maximum horsepower of 117 at 2200 r.p.m., while Model A-8 has a 5-in. bore and develops 136 hp. at 2100 r.p.m. Both have a stroke of 5½ in. Cylinder heads of each engine are made in two separate castings. Removable cylinder liners are fitted. Downdraft carburetion, a fuel pump, an oil-type air cleaner and thermostatically controlled cooling are other features of the powerplants.

Power is transmitted through a single-plate clutch and five-speed unit-mounted transmission to a full-floating, double-reduction rear axle having spiral-bevel gears in the first reduction and herringbone gears in the second. Pinion and countershaft are mounted on one single and one double row ball bearing. Axle reductions of 6.377 and 4.954 are available on both models, 7.988:1 being standard in Model A-7. A vacuum booster amplifies the effect of the four-wheel service brakes. The front wheel brakes are two-shoe Bendix and the rear internal band brakes of International design. The hand brake is a disk type and is mounted on the transmission.

The rear springs are dual semi-elliptics, mounted one above the other, with the axle between. Front ends of both the upper and the lower spring are attached to a swiveled beam equalizer, which is pivoted on a pin anchored in the front bracket. The swiveled beam acts as an equalizer for torque and driving stresses from the upper and lower springs when power is applied. A longitudinal pin in the swiveled beam directly below the driving pin allows for flexibility of the lower spring and prevents its movement in a lateral direction. The rear ends of the springs are attached to shackles, the upper spring having a separate shackle and the lower being attached to the combined shackle and swivel.

Frames have side rails with a maximum section from pressed steel of 12⅛ x 3½ x ⅜ in. Six, seven and eight cross-members are used in the 160, 180 and 220-in. wheelbases respectively. Cast-steel wheels with integral hubs and 9.75/20 balloon tires dual at the rear are standard equipment.

When cabs are furnished with these models they are built integral with the cowl and harmonize with the hood and fenders. They are built of steel, insulated against heat, and have drop windows and adjustable two-piece windshields.

Minerva May Leave U. K.

LONDON, Jan. 5 *(by mail)*—The first motor manufacturer to withdraw from the British market following the devaluation of sterling is the Belgian Minerva Co. Shareholders of Minerva Motors (England) are to be asked to approve of the voluntary winding-up of the undertaking at a meeting on Jan. 18, 1932. The Minerva in Britain falls into the high-powered class, there being no model under 21 hp. The company did introduce a small Minerva paying an £18 tax in 1927, but apparently this model did not meet with success as it was withdrawn again in 1930. With the increase in prices necessitated by the exchange fluctuations and the effect of the present trade depression on the high-priced car market, the board states that it feels there is little hope of sufficient profitable business maturing in the near future to warrant a continuance of the company's activities.

Studebaker Sets Up Bonus for Salesmen

Payments Will Be Made at Slack End of Year's Sales

SOUTH BEND, Jan. 25 — Factory participation in the compensation of retail salesmen is announced by Studebaker with the establishment of a flexible sinking fund, from which retail salesmen who sell 20 units or more between Jan. 1 and Sept. 30 will receive a bonus payment at the rate of $5 per car in three equal instalments at the end of October, November and December. Payments from the fund are contingent upon the salesman completing a factory-sponsored training course, and upon his remaining in the employ of a Studebaker dealer during the whole nine months' period named. Retail salesmen who fulfill these three requirements will be qualified members of the newly created Studebaker Master Salesmen's Club.

Through this new plan, Studebaker aims (1) to give the retail salesman a more stable income throughout the lean selling months of the year; (2) to encourage a much greater continuity of service on the part of the retail salesmen in dealer organizations; and (3) to reaffirm in a very practical way its recognition and appreciation of the vital part which the retail salesman plays in the success of any factory.

These objectives were brought out clearly by Roy H. Faulkner, vice-president, Studebaker Sales Corp. of America, when he announced this new plan today. Pointing out that the new plan is but a part of the greatly amplified sales program being inaugurated by Studebaker this year, Mr. Faulkner said:

"The work of selling automobiles at retail calls for greater ability, greater knowledge and greater training every year. As a result, steady, capable salesmen are being attracted to automobile retail organizations in greater numbers than ever before."

Automotive Linage In Dailies Jumps

Automotive advertising linage in more than 300 newspapers, published in 80 cities, showed an increase of 21.7 per cent in December, 1931, as compared with the previous December, according to Media Records' figures, compiled and printed by *Editor & Publisher* in its Jan. 23 issue. This was the largest increase recorded in any newspaper advertising classification during the past year. A comparison of automotive newspaper advertising fluctuations monthly during 1931 (in terms of the same month in 1930), follows:

Automotive Per Cent	Total (All Groups) Per Cent
+21.7	— 8.8
—33.7	— 9.5
—29.9	—11.8
—11.8	—13.8
—13.8	— 6.5
—14.9	— 6.5
—16.7	— 9.9
—22.4	—11.3
—27.4	—12.6
—41.8	— 8.2
—38.6	—11.2
—33.4	—13.6
Average for year—	
—24.8	—10.5

Parts Index Tops November

But is 5 Points Below Figure for December of 1930

NEW YORK, Jan. 25—Parts and equipment index for the month of December, 1931, shows an increase over November, although falling five points below December of last year, according to the Motor and Equipment Manufacturers Association. Index for the month was 64 as compared with 59 in November, and with 69 in December, 1930.

The only department contributing toward the advancement over the previous month was that of original equipment, which shows an index of 59, as compared with 48 in November and with 64 in November of a year ago.

Service parts index for the month was 94, as compared with 102 in November, and with 100 in the previous December.

Index for accessories was 66 as compared with 73 in the preceding month, and with 55 in December of the previous year.

Service equipment index for the month was 49, as compared with 60 in November and with 75 in December, 1930.

Fuel Synthesis Studied

During the early development of new oil fields the production of oil is accompanied by large quantities of natural gas. Generally, markets for this gas are not readily available, and much of the gas is wasted. One possible use for the gas is in the pyrogenic synthesis of gaseous, liquid and solid hydrocarbons of types for which there is a ready market. Some work on the synthesis of motor fuel from natural gas has been done by the chemists of the Petroleum Experiment Station of the U. S. Bureau of Mines, assisted by the personnel of the Helium Division. This work was begun at Bartlesville, Okla., in June, 1928, and a report on it, Preliminary Report on the Pyrolysis of Methane, by H. M. Smith, Peter Grandone, and H. T. Rall, has been published recently. As is generally known, methane is an important constituent of natural gas. Following is a summary of the results obtained to date:

The pyrolysis of methane yields (exclusive of carbon and hydrogen) higher hydrocarbons, among which the following have been identified: Ethylene, acetylene, benzene, napthalene, anthracene and pyrene. Besides ethylene and acetylene, other gases are produced in small amounts, among which methyl acetylene is suspected. There are also formed unsaturated liquids boiling below and above benzene, and liquids and solids of very high boiling point, presumably high in carbon content.

The yields of these products obtained from methane at atmospheric pressure depend on the temperature and rate of flow through the cracking zone, assuming other factors equal. However, an increase in duration of heating is not equivalent in all respects to an increase in temperature.

Ethylene appears to be the dominant factor at the beginning of the pyrolysis, the other hydrocarbons being formed subsequently; but it is impossible to determine yet whether the light oil proceeds from ethylene or acetylene.

Dilution of the gas with either nitrogen or hydrogen affects the yields, probably due primarily to heat transfer and polymerization. In addition, hydrogen decreases the yields due to suppression of the dissociation of methane. With both diluent gases the per cents of ethylene and acetylene in the total products are increased.

Ethane admixed with methane increases the yields of all products considerably.

Certain relationships between the yield and the variable factors of temperature and rate of flow were found to exist.

Opel Works Exports Heavily

G. M. Subsidiary Shipping Parts to Other Plants

NEW YORK, Jan. 25—Adam Opel Works A. G., Russelsheim, Germany, subsidiary of General Motors Corp., has entered into an active export program on its recently developed small cars, the 1.2 liter and the 1.8 liter types. Parts for these cars are being shipped from Russelsheim to various Continental assembly plants of General Motors to be assembled for the local markets, just as parts are shipped from this country. It is planned to follow a similar course at some of the other overseas assembly plants of General Motors.

The Opel plant is enjoying a remarkable business in export out of Germany. Approximately one-half of its volume is being exported, and a return to normal conditions generally in the export markets should bring with it a very substantial volume for these smaller, more economical cars.

These small cars have a logical place in most of the foreign markets.

+ + CALENDAR OF COMING EVENTS + +

SHOWS

Boston, Mass., Automobile.....Jan. 23-30
Minneapolis, Minn., Automobile.Jan. 23-30
Hartford, Conn., Automobile...Jan. 23-30
Detroit, Automobile .....Jan. 23-30
Montreal, Automobile .....Jan. 23-30
Baltimore, Automobile .....Jan. 23-30
Pittsburgh, Pa., Automobile...Jan. 23-30
Portland, Ore., Automobile.....Jan. 23-30
Springfield, Mass., Automobile..Jan. 25-30
Harrisburg, Pa., Automobile...Jan. 25-30
Seattle, Wash., Automobile.....Jan. 25-30
St. Petersburg, Fla., Automobile, Jan. 27-29
National Automobile, Chicago, Jan. 30-Feb. 6
Salon, Chicago .....Jan. 30-Feb. 6
Washington, D. C., Automobile Jan. 30-Feb. 6
Cleveland, Automobile ....Jan. 30-Feb. 6
Grand Rapids, Mich., Automobile, Feb. 1-6
Springfield, Ill., Automobile.....Feb. 4-6
Plainfield, N. J., Automobile.....Feb. 6-13
St. Paul, Minn., Automobile ....Feb. 6-13
St. Louis, Automobile.....Feb. 7-13
Denver, Colo., Automobile.....Feb. 8-13
Indianapolis, Ind., Automobile..Feb. 13-19
Salon, Los Angeles, Calif.....Feb. 13-20
Kansas City, Automobile.....Feb. 13-20
Mankato, Minn., Automobile...Feb. 17-20
Peoria, Ill., Automobile.....Feb. 17-21
Holyoke, Mass., Automobile...Feb. 18-22
Des Moines, Iowa, Automobile..Feb. 21-26
Wichita, Kan., Tractor and Power Equipment .....Feb. 23-26
Salon, San Francisco, Calif..Feb. 27-Mar. 5
Albany, N. Y., Automobile..Feb. 27-Mar. 5
Berne, Switzerland, Automobile.Mar. 11-20
National Aircraft, Detroit, Mich..Apr. 2-10

FOREIGN SHOWS

Copenhagen, Automobile ..Feb. 26-Mar. 6
Lyons, France, Passenger and Commercial .....Mar. 7-20
Geneva, Switzerland, Passenger and Commercial .....Mar. 11-20
Vienna, Passenger and Commercial .....Mar. 13-20
Tel Aviv, Palestine (Levant Fair) .....April 7-30
Milan, International Automobile Salon .....April 12-27
Zagreb, Jugoslavia, Automobile Salon .....April 23-May 2
Peznan, Poland, International Fair .....May 1- 8
Dublin, Commercial .....May 4- 7
Budapest, International Fair...May 7-16
Belfast, Commercial .....May 25-28
Bordeaux, Fair .....June
Cork, Commercial .....June
Inverness, Commercial .....June 21-24
Southampton, Commercial .....July 5- 9
Llandrindod, Wales, Commercial .....July 20-22
London, Olympia Show .....Oct. 13-22
Glasgow, Scottish Motor Show..Nov. 11-19

CONVENTIONS

S.A.E. Annual Meeting, Detroit, Mich., Jan. 25-29
Nat. Assoc. of Engine and Boat Mfrs., New York City. .....Jan. 29
American Institute Mining & Met. Engineers, Meeting, New York City, Feb. 15-19
American Welding Society, Annual Meeting, New York City.....Apr. 27-29

"Just as good as a KUPPENHEIMER"

THE ancient argument of competition "it's just as good as....." is not fooling the automobile manufacturer—especially about mufflers.

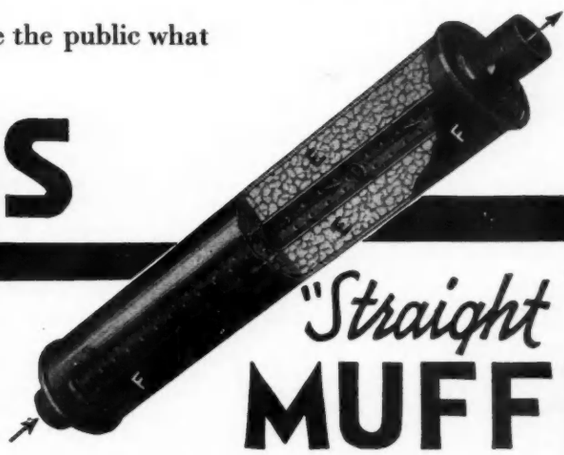
The Burgess Straight-Thru Muffler is giving the public what it wants—power, quiet and speed.

Complete silencing without high back-pressure, obtainable only by the Burgess principle of muffling, has assisted in developing the modern automobile—powerful, fast, economical and quiet.

Don't let competition fool you—give the public what it wants.

the ANCIENT ARGUMENT OF CHEAP COMPETITION

BURGESS



As illustrated, the Burgess Muffler consists of three principal parts; a straight open perforated pipe, D, surrounded by a sound absorbing material, E, which is enclosed in a metal covering, F. The exhaust gases from the engine pass straight through the perforated pipe, D, but the exhaust noises are absorbed, assuring satisfactory muffling.

"Straight Thru" MUFFLER

BURGESS BATTERY COMPANY - 111 W. Monroe St. Chicago

NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

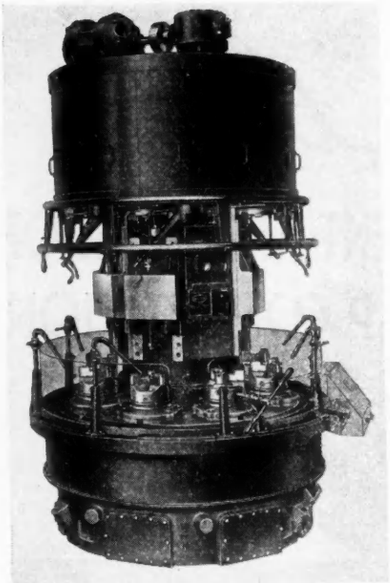
Bullard Mult-Au-Matic Center Lathes

After a long period of production experience and research, The Bullard Co., Bridgeport, Conn., offers the type D Mult-Au-Matic and Center Lathe in 6 and 8-spindle models. Chuck capacity of the Mult-Au-Matic ranges 10, 12 and 18 in. respectively. The center lathe has a capacity of 4 in. in diameter and 16 in. between centers.

The work spindles are of heat-treated forged steel, each mounted on a pair of well lubricated, preloaded, anti-friction roller bearings.

Each spindle is provided with a drive gear of greater diameter than work capacity of the machine, which permits an application of driving power appreciably in excess of cutting requirements.

The spindles are also equipped with an individual spindle brake mechanism, which, during index, brings to a stop all spindles, thereby insuring rapid, quiet reengagement of gears.



The five or seven feed works applying respectively to the six or eight spindle Mult-Au-Matics differ from former practice in several respects, most noteworthy of which is the use throughout of well lubricated, anti-friction bearings. To further increase the operating and maintenance efficiency of these units, the former heavy construction has been further increased to care for unforeseen overloading and unusual conditions.

Eleven speed changes are available on the new Mult-Au-Matic: 33 to 300; 27 to 241, and 20.2 to 182 r.p.m. respectively. The center lathe provides eleven spindle speeds from 46.8 to 421 r.p.m. The motor drive is a constant speed AC or DC motor throughout. The size of the motor varies from 20 to 35 hp., at 1760 r.p.m. under load.

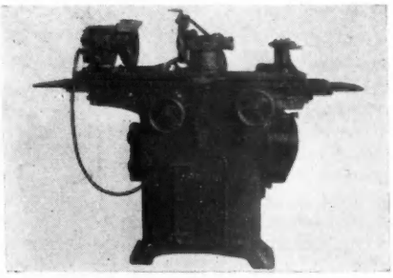
The diameter of the base is 78½ in. for 6-spindle and 87½ in. for 8-spindle machines. These dimensions are larger for the 16 in. size, being 87½ in. for the 6-spindle, and 98 in. for the 8-spindle.

Landis Tool and Cutter Grinder

A new tool and cutter grinder for tool rooms and light production work has been placed on the market by the Landis Tool Co., Waynesboro, Pa. Unlike conventional machines, the bed of this one is of box type construction. A water reservoir is cast integral with it, making it a simple matter to apply a wet grinding attachment when desired. Two of the electric motors are mounted entirely within the bed while the third is mounted on the work head itself. An additional convenience is in the form of three separate snap switches mounted at the left hand end of the bed.

The traverse motor is mounted within the bed at the right. Three traverse speeds are secured merely by the shifting of a flat leather belt. With this method of motor mounting the motor is protected from dirt and moisture while, at the same time, it may be used to drive the water pump when the wet grinding attachment is supplied. The grinding wheel is driven by a motor mounted on the lower end of the column. This motor too is protected from dirt and moisture. The reversing of the two step motor pulley will give a second grinding wheel speed. Regardless of the position of the wheel head, the driving belt never runs in a twist.

The machine is offered with plain or universal equipment. In addition, certain special equipment may be had should a user wish to utilize this machine for light production work or for certain special tool room work. For example, a multi-speed work head and suitable footstock may be secured instead of the standard heads. Six work speeds are available with this heavier head but only a constant speed motor is used. Then a quite sturdy surface grinding head may be purchased extra when a large amount of surface grinding is to be done.



The weight of the Plain machine, without electrical equipment, is 2325 lb., the Universal machine weighing 2525 lb., without electrical equipment.

Hisey Texdrive Grinder

The Hisey-Wolf Machine Co., Cincinnati, Ohio, has added a Texdrive grinder for 10, 12 and 14 in., vitrified or high-speed grinding wheels. Cast steel wheel guards pivot to any desired angle and have hinged covers for convenient access to wheels, in accordance with specifications of the American Standards Association. Spark shields are adjustable in steel box-type slides, making them as strong as the guards themselves. Tool rests are easily adjusted or removed.

The straight front pedestal presents the wheels far in advance of the machine proper, affording maximum freedom of movement to the operator.

Although a belt guard snugly encases sheaves and belts, the motor can be adjusted without removal of hood.

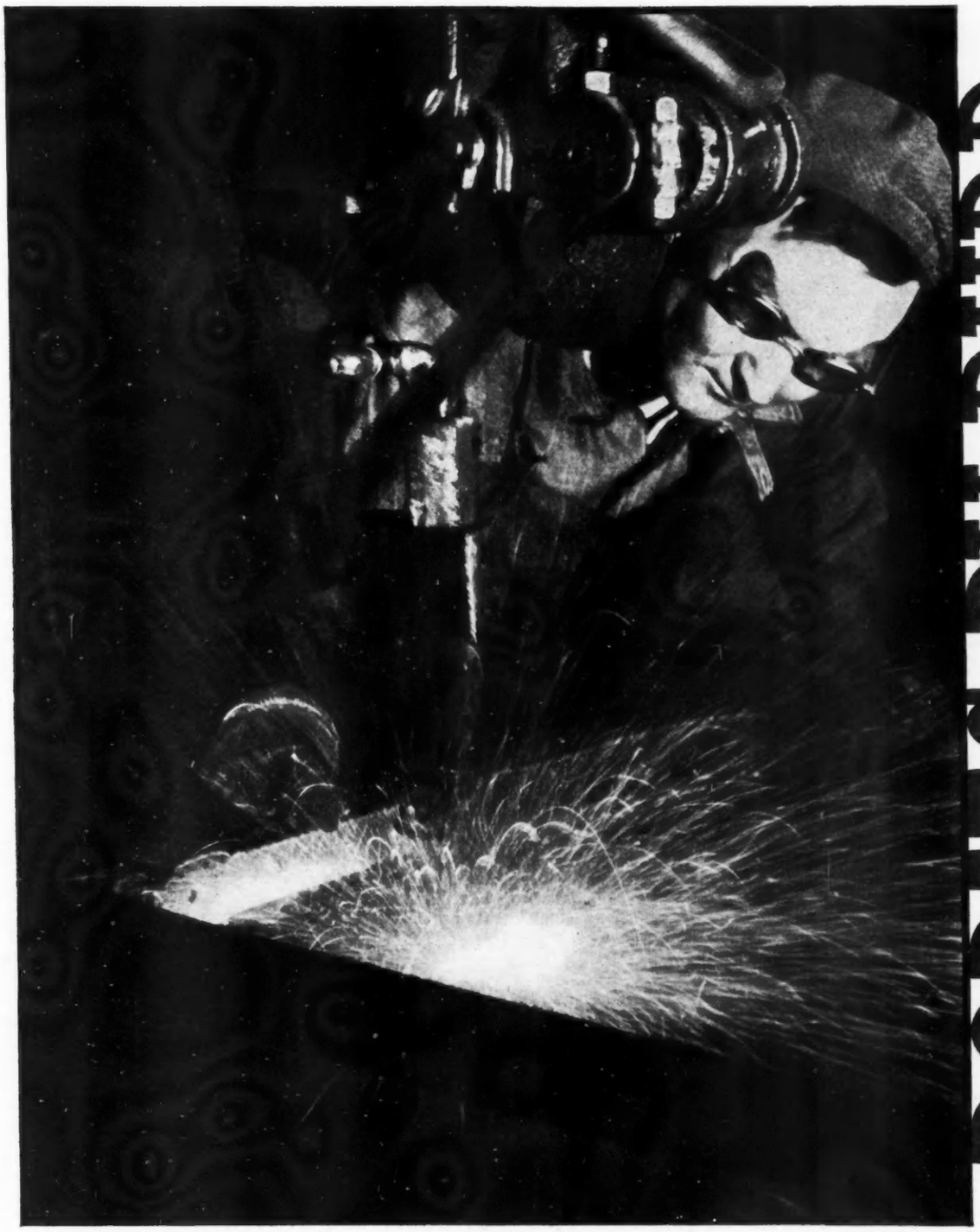
Dirkes Lubricating System

Dirkes Industries, Inc., 1644 West Fort St., Detroit, is offering a complete line of lubricating systems for industrial and automotive applications, including a double outlet two-line system; a quick release one-shot multi-tube; and a two line progressive system.

Claims made for the two-line system include simplicity, compact construction, ability to operate under unusual heat conditions, ease of application or installation, and a large variable discharge. It will be noted moreover that cut shaped metallic pistons are used which are said to seal with pressures up to 10,000 lb. per sq. in., and could permit considerable out of round or tapered hole condi-

(Turn to page 178, please)

Few things can kill the new owner's enthusiasm for his car as quickly as persistent body noises. Budd builds bodies that are not only safe — but quiet. Where there are no joints, there can be no squeaks or rattles. By reducing the number of body parts and by the extensive use of flash welding, Budd eliminates joints. The Budd one-piece body is made from only eight major parts—flash welded into one jointless unit. A quiet body—and a body that stays quiet.



★ BODIES BY BUDD ★

Originators of the All-Steel Body. Supplied to Manufacturers in the United States, Great Britain, France, Germany.

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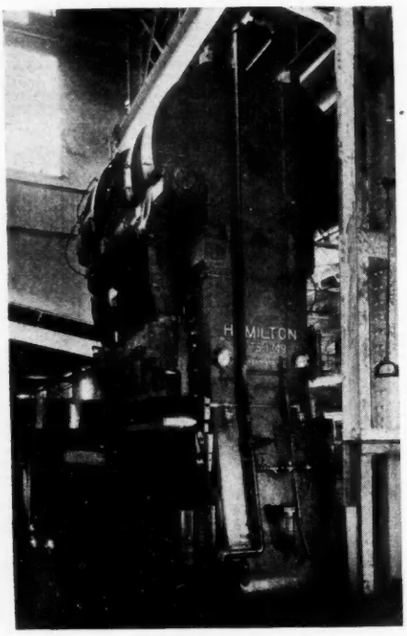
tions, so that it is claimed the system will operate irrespective of considerable wear that might occur. Other features pointed out in connection with the use of the cupped piston is de-



creased tendency to stick or jam, and the ease of replacement of parts, involving no machining.

The two line double outlet system is composed of a dual transfer valve and a series of two-way line valves. The main line from the pump may be anything from hand-operated to full automatic electric.

Gleason Spiral Bevel Pinion Burnisher

An 18 in. burnishing machine for spiral bevel pinions has been placed on the market by the Gleason Works, Rochester, N. Y. This machine is an adaptation of the 18 in. testing and lapping machine. Burnishing on the new machine consists of running a soft pinion in mesh with a hardened mating gear to smooth out any cutter marks on the tooth of the pinion. It is not intended to compensate for poor gear cutting. The principle is to hold the gear and pinion in proper contact under pressure, and instead of the rocking motion formerly used in burnishing, to give a slight movement lengthwise of the face.

The relative motion between the gear and pinion is obtained in the same manner as the lapping motion on the lapping machine. The pinion drives the gear and as the two rotate, the position of the gear is changed continuously and automatically to effect a combined horizontal and vertical movement of the gear, relative to the pinion.

As the position of the gear is changed, the pinion, which is held in mesh with a spring, moves in and out with the gear. This results in an "in and out" movement of the pinion with reference to the gear axis.

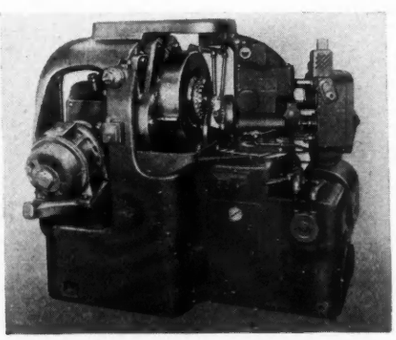
If desired, this machine may be equipped with several time saving features at an additional cost. These include the automatic chucking and dechucking of both the gear and pinion, and "in and out" movement of the pinion head for loading and unloading.

The net weight is 3500 lb. Floor space required is 46 x 48 in.

Gleason Spiral Bevel Gear Rougher

A spiral bevel gear rougher with a capacity for gears up to 5½ in. cone distance 8 to 1 ratio, 11 in. P.D., and 3 D.P., has been placed on the market by the Gleason Works, Rochester, N. Y. It is similar in construction to the larger, No. 20 machine.

The time required for removing the roughed cut gear and replacing it with a blank has been reduced to the minimum. The operator has only to remove the gear which is automatically dechucked and ejected, then put on a new blank and turn a handle. The gear is automatically chucked and moved into cutting position.



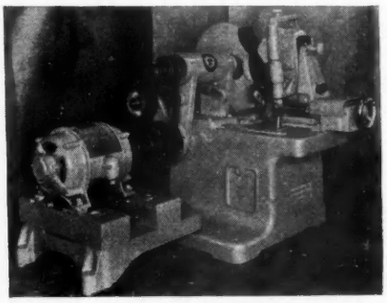
The automatic features of the machines have been fully protected by special safety devices embodied in the design, making the operation of the machine as nearly fool-proof as possible. The operating controls are grouped in a convenient location.

Standard Gleason roughing cutters, 6, 9, and 12 in. diameter, are used. Blades for these are furnished in sets so that the heads can be refilled without returning them to the factory.

Main drive is by two 7½ hp. direct connected motors. Cutter speeds from 75 to 180 ft. per minute. Floor space —48 x 72 in., net weight—9500 lb.

Polishing and Buffing Machine

Providing a capacity up to 6 in. in diameter, the type 101 polishing and buffing machine recently developed by the Production Machine Co., Greenfield, Mass., is said to offer many interesting features. Essentially, it combines a new patented centerless power feed unit and a high speed polishing or buffing wheel. Careful provision is made for quick set-ups



and protection through hoods and guards. The machine takes 7½ to 10 hp., the drive being through a Dodge triple V-belt arrangement. It is available for belt drive or direct motor connection. Floor space, 47 x 56 in. respectively. Weight 1200 and 1400 lb. respectively.

Automatic 4000 lb. Lift Truck

A 4000 lb. capacity low lift industrial truck, model LG-2, has been added by the Automatic Transportation Co., Inc., Chicago, Ill., according to a recent announcement. It is designed specifically to supplement hand equipment particularly for handling skid platforms. This truck is suitable for high speed operation and has the requisite maneuverability for close quarter requirements. Safety is provided by the use of the interlocking foot controller.